JUNE 1956 35 CENTS

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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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MOST VALUABLE PLAYER: THE CATCHER

By Lew Fonseca *Photos posed by Yogi Berra*

What the Owners Say About the

RAMBLER

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Upon my honor I swear that I shall hold in sacred trust the rights and privileges conferred upon me as a certified mechanic. Knowing full well that the safety and lives of others are dependent upon my skill and judgment, I shall never knowingly subject others to risks which I would not be willing to assume for myself, or for those dear to me.

In discharging this trust, I pledge myself never to undertake work or approve work which I believe to be beyond the limits of my knowledge; nor shall I allow any superior to persuade me to approve aircraft or equipment as airworthy against my better judgment; nor shall I permit my judgment to be influenced by money or other personal gain; nor shall I pass as airworthy aircraft or equipment about which I am in doubt, either as a result of direct inspection or uncertainty regarding the ability of others who have worked on it to accomplish their work satisfactorily.

I realize the grave responsibility which is mine as a certified mechanic, to exercise my judgment on the airworthiness of aircraft and equipment. I, therefore, pledge unyielding adherence to these precepts for the advancement of aviation and for the dignity of my vocation.

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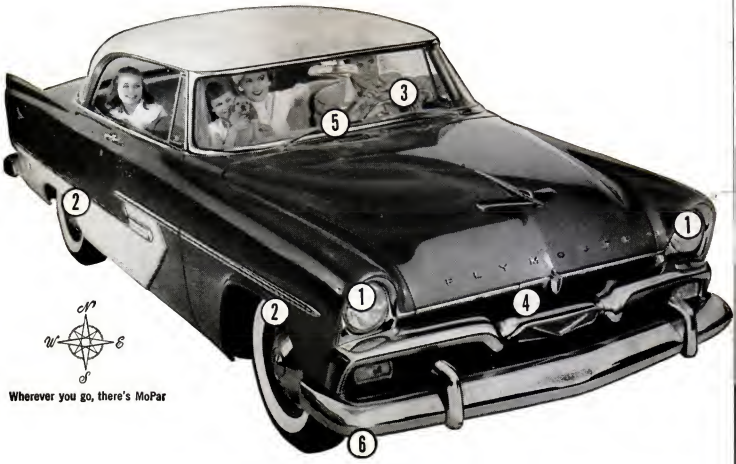

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Next Month

OLD-TIME New England sailors are doffing their Nantucket caps to a strange craft sailing the waters around Cape Cod. It's a tripont, a three-hulled sloop designed and built by a 71-year-old physician, Dr. Edwards Hermon. An experienced catamaran builder and sailor, Doctor Herman says the three-hulled craft doesn't tend to nose-dive in rough water like a catamaran, steers more steadily and is more maneuverable. A feature in July tells how the tripont was built and how it handles even in heavy seas.

Information not listed on articles in the index, starting on page 58, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, *Popular Mechanics*, 200 E. Ontario, Chicago 11, Ill.

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See pages 58, 60 and 62
for other items and manufacturers of available products

24% more road horsepower—for hill climb!

24% more road horsepower—for passing!

Champion introduces a great new spark plug

Tests prove new Champions give big power boost to cars that have gone about 10,000 miles without a spark plug change. If you haven't changed your plugs recently, put in new Champions—and feel the difference immediately!

You just can't imagine what a difference new 5-rib Champions can make in your car's actual road horsepower.

But this difference has been proved—without a shadow of a doubt—in tests conducted by one of the country's largest independent research centers. Regular passenger cars whose plugs had gone roughly 10,000 miles were tested first with their regular plugs; then with new Champions.

Nothing about these cars was changed except their spark plugs. Yet there was an immediate increase in their road horsepower—the real power actually delivered at the rear wheels!

Some of the results were spectacular. For example, a 1955 six-cylinder car whose plugs had gone 10,000 miles actually showed a gain of 72.5% in road horsepower! A 1954 V-8, whose plugs had gone 12,000 miles, got a boost of 53.5%. Some cars, of course, showed smaller gains; 20% in the case of one 1955 V-8 and only 6.5% (the smallest gain) in another. *But the average road horsepower gain for all cars tested was a fraction over 24%!*

And what a difference these new plugs can make in your car's starting! Tests show Champions reduced starting time by as much as 71%—with an average of 39% for all cars tested!

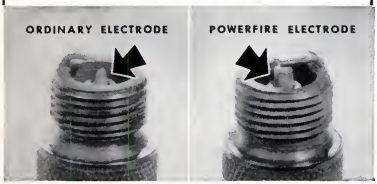
If you haven't changed plugs recently, it's high time to install new Champions. Whatever your car, these great new plugs give you more actual road horsepower—*immediately!*

24% more road horsepower—for the straightaway!

Quicker starts, too—39% quicker!

-it can increase road horsepower by 24%!

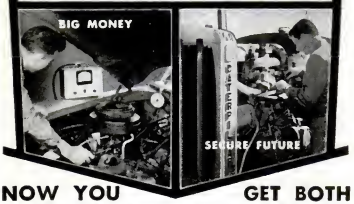
SEE HOW MUCH BETTER AND LONGER NEW CHAMPIONS STAND UP IN TODAY'S HIGH-POWER ENGINES



New Powerfire electrode makes the difference! Both of these spark plugs have been subjected to identical use in a modern high-compression engine. You can see the old style electrode **(left)** is badly pitted and burned away. Plugs like that in your car often misfire . . . waste power and gas. Champion's new Powerfire electrode **(right)** is still able to give many more miles of powerful, economical performance.

YOU'RE HIRED

WHEN PROPERLY TRAINED AS AN ALL-AROUND MECHANIC



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ACROSS THE DESK

Do-It-Yourself Car Wash

Car owners on the western fringe of Philadelphia who do not have car-washing facilities can take over the enclosed car-washing section of Harry K. Means Service Station for just 1½ cents a minute.

In addition to making the space available to car owners, Means also furnishes water, rags, soap and whisk broom without extra charges.

The average do-it-yourself car washer completes the job in little more than one half hour.

Charles P. FitzPatrick,
Philadelphia, Pa.

To the Editor:

Hang your heads in shame! You didn't mention Volkswagen, probably one of the best—(what can I call it? It doesn't seem to fit into the car category)—dreams on the road, in that Auto Section in February. You mentioned Sports Cars but no VW; you mentioned the U. S. cars but no VW. For

(Continued to page 8)

IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of $4,000 to $10,000 and up?

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(Continued from page 6)

a boo-boo like that we'll have to give you 500 lashes across the bare nose with a wet noodle.

Paul M. Roland,
Philadelphia, Pa.

Stand by, Mr. Roland. We expect to give the VW the full treatment before long in an Owners Report.

Our SS United States Under Power

If you see a miniature edition of the SS *United States* churning the waters in the Los Angeles area, we hope you recognize it as the model presented on the cover and in the Craftsman Section of *PM* back in December 1952 and following issues.

C. W. Hering of Los Angeles built the ship from *PM* plans, but added a motor and radio controls . . . and the model cruises majestically!

"My model is built from your blueprints with the exception of the width," writes Mr. Hering. "I wanted this model to operate in water. My previous experience tells me that a 36-inch ship with 4-inch beam with

a lot of superstructure will not stay upright unless you put a lot of lead in the bottom, and by the time you add electric driving motors and radio and all needed batteries, you get below the water line and

nearly swamp. Thus if your deck is shown 2 inches wide, my similar deck will be 3½ inches wide, and everything else is in that proportion. I am using two ¾-inch bronze

(Continued to page 10)

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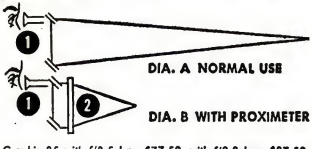
DIAGRAM A: Rangefinder (1) normally focuses upon subjects as close as 3 feet.

DIAGRAM B: Lens segment (2) in front of rangefinder bends light rays from subject, allowing rangefinder focusing for extreme close-ups.



Graphic 35 with f/3.5 lens: $77.50; with f/2.8 lens: $87.50; Proximeter I or II: $22.95. Pay only 10% down—take up to 20 months to pay! For Graphic 35 folder see your Graflex Dealer or write Dept. PM-66, Graflex, Inc., Rochester 8, N. Y.

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(Continued from page 8)

propellers driven by two 6-volt motors off a 6-volt Willard wet battery, steered by E. C. steering relay and radio-operated by Citizenship 27½-meg. radio. I get about 15 percent above scale speed and about 500 yards radio control. I have had many compliments on both the appearance on shore and action in the water."

To the Editor:

Please send your Precut-House book as advertised. I bought your Ranch Style House book about 2½ years ago and built it. I figure I've got about $8500 in the house. I used the bench-build method and eight-inch cement blocks for the foundation, with a four-inch block and a cement brick on top to make the same shape as the cement foundation in the plans. I surely would not have a house today if it was not for your inspiring book and plans. I was offered $19,000 for it last spring.

Matthew A. Civilette,
124 Howard St.,
Fredonia, N. Y.

To the Editor:

Here are pictures of "Kaligah, the only wooden Indian in the world with an electronic brain." I thought you might get a kick out of seeing what I conceived

in a moment of boredom at a local club.

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(Continued to page 34)

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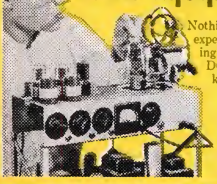

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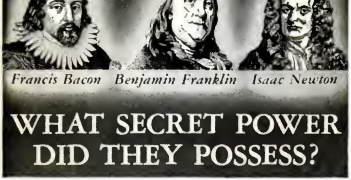

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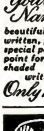

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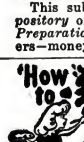

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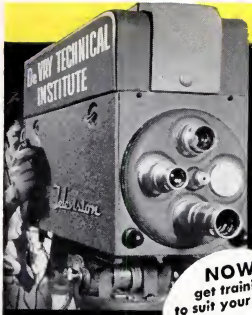

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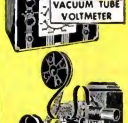

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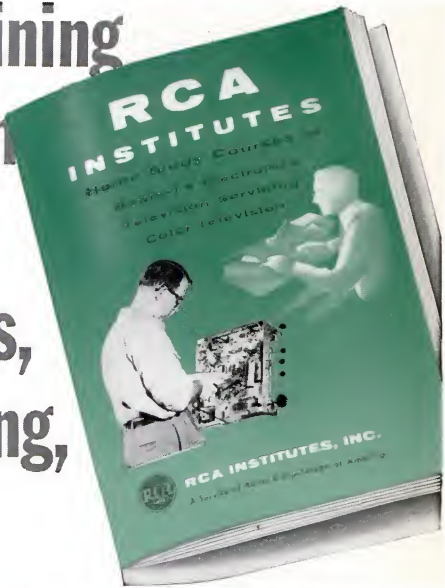

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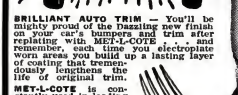

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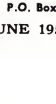

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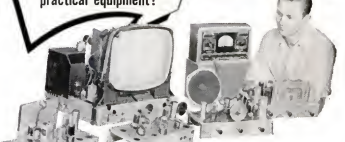

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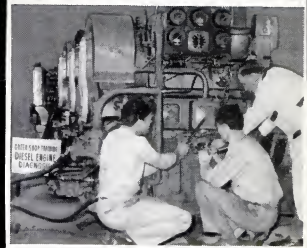

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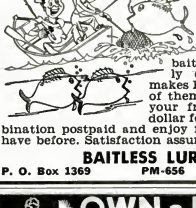

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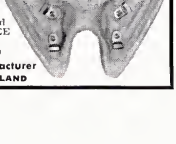

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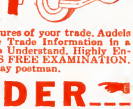

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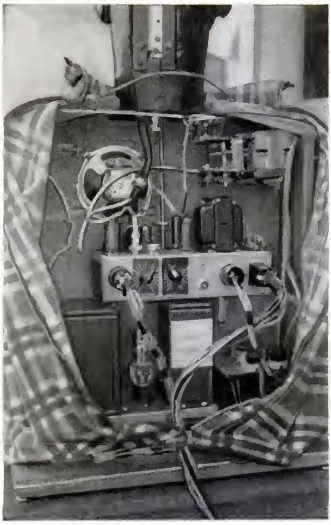

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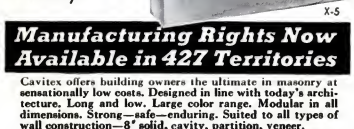

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640x15	5.68	750x16(6)	6.96	650x20	10.66	1000x20	19.98
650x16	5.78	800x15	8.86	700x20	12.68	1000x22	21.98
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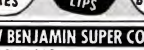

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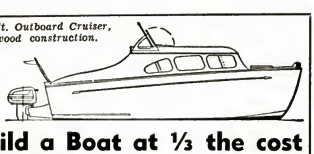

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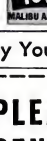

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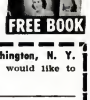

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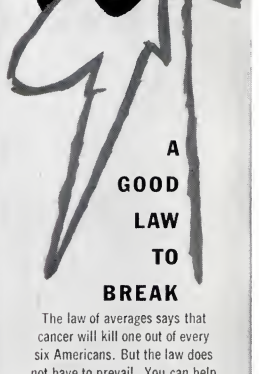

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IMPORTANT NOTICE—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described in order to avoid possible liability for patent infringements.

You too can become a

chain store tycoon in a few short weeks!

Self-Service Toy Racks In Local Stores Are Revolutionizing Old Sales Methods, Earning Big Profits for Distributors

By Joseph F. Parrish
12 Hunt Lane, Crestline, California

"When I sold my grocery store and was appointed by Amen Industries last March as an independent Distributor for their self-service toy line, it turned out to be one of the luckiest things I ever did.

"I had watched the 'help-yourself' type of merchandise revolutionize the grocery business, and if the same thing was about to happen in the toy industry, believe me, I wanted in on the ground floor! The way it worked out, the Toy Carousels, as the racks are called, have given me the 'toy department concession' in many types of shops and stores.

"In less than a year, our original 5 racks have grown to a chain of 30 locations, and a single location has taken in as much as $50 per week. The merchandise sells itself. All my wife and I do is spend six or seven days a month covering the route in our new station wagon to pick up the cash and re-stock our racks."

NEW PROFITS FROM AUTO ITEMS!

"When Amen added its new line of auto accessories recently, I took this on too. From first indications, this will just about double my income.

"The store owners are tickled pink with the extra business the racks bring. I'm my own boss with a growing income, and a solid future, and I still have time to enjoy life. What more can a man ask?"

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Reservoir Evaporation

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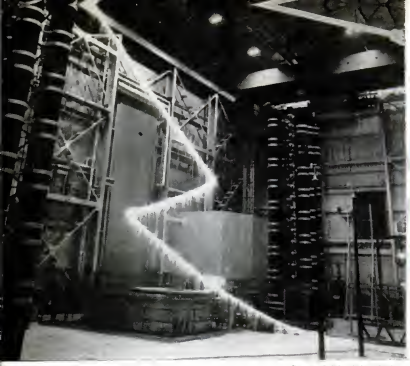
Surprised boy! Bolt split a tree overhead and demolished cart in which he was sitting—without harm to him

Lightning Plays Queer Pranks

By Clifford B. Hicks

SINCE THE DAYS of the cave man, lightning has flashed fear and fascination into the human mind. At this moment about 3600 thunderstorms are lashing the earth. Hidden in the swirling depths of these storms is a power that dwarfs the energy of the H-bomb. An infinitesimal part of this power manages to escape, crackling out in a sudden bolt of lightning.

The most predictable thing about these lightning bolts is that they are utterly unpredictable. They perform weird, wonderful and sometimes tragic tricks. Lightning occasionally brings death. It may also bring striking evidence of Nature's sense of humor hidden in rumbling "laughter."



General Electric photo

In lightning laboratory, a strand of wire vanishes in a jagged streak of flame as 5,000,000 volts of artificial lightning vaporize the metal completely. Engineers use such bolts to study natural lightning

Early Pikes Peak weatherman went to roof of building during storm. Whirling anemometer was a "solid ring of fire," chimney a "flaming arrow" and his fingers, wristbands and mustache were electrified

One lightning bolt struck a building, setting it afire, then accommodatingly leaped to a nearby fire-alarm box, touching it off to bring firemen who put out the blaze.

Then there's the case of the young boy who was sitting in a cart beneath a tree. Lightning suddenly split the tree, knocked the sides of the cart from around the boy and left him unharmed.

Surprised Horse!

There's a horse in northern New York State that must be one of the most surprised animals of all time. A bolt struck Old Dobbin and knocked off his shoes but otherwise left him unharmed. And it's hard to beat the true story of the woman who was lying in bed, her hair in bobby pins, when lightning struck the house. The bolt turned the bobby pins into curling irons and gave the woman a permanent wave, but didn't harm so much as a hair of her head. Still another bolt executed a cow in New Hampshire without even touching the farmer who was milking her. Over in France, lightning once killed all the black sheep in a flock without touching a single white mutton chop.

What is lightning? Ben Franklin proved that it is a form of electricity, but a thundercloud still wraps its lightning bolts in blackness. Scientists, disclaiming any really precise knowledge, now believe that storms cook up their thunderbolts according to the following recipe:

The swirling drafts of a thunderstorm create positive and negative charges—electricity. Through a process not yet completely understood, the turbulence of the air sorts out the charges, dropping the negative ones to the bottom of the heap and pushing the positive ones up to the top of the cloud. This is an unbalanced situation which Nature abhors. The negative charges, denied their positive mates, start attracting positive charges from the earth below. These positive charges soon are scurrying along the surface of the ground toward the spot right under the cloud. If you are standing on the ground you can't feel them, but occasionally they produce weird halos called St. Elmo's fire around objects under the cloud. These positive charges pile up on the ground, striving desperately to reach their opposite numbers on the bottom of the cloud but prevented from making the jump by the air, which serves as a layer of insulation.

Lightning Strikes Upward

But eventually the attraction becomes so great that the charges literally punch a hole through the air. Then . . . *bang!* In a tremendous surge, or series of surges, the positive charges leap up to their mates. Thus, in most cases, lightning actually strikes upward. The stroke travels about 100,000 times as fast as sound. The speed confuses the human eye which sees the stroke as something downward from the menacing cloud. The downward stroke in most cases is an optical illusion.

The upward stroke is what does the damage, killing some 500 persons a year in the United States. Over a period of years, a good deal of money, time and brains has been hurled at the problem of how to minimize damage by lightning. The best example of such research is the General

Electric High-Voltage Engineering Laboratory at Pittsfield, Mass., where scientists cook up and throw their own thunderbolts.

Such bolts represent 5,000,000 volts of electricity. In some experiments they are hurled through copper wire, converting the metal instantly into a gas amid a spectacular shower of sparks. Other thunderbolts are tossed at model houses, clothier's dummies, power lines and trees. Scientists even move the big lightning generator outdoors through a 50-foot door and hurl thunderbolts at anything nearby.

Lightning Traps

Artificial thunderbolts aren't the only phase of lightning research. Engineers also are operating lightning traps throughout the country. Their basic goal is to photograph and examine natural lightning in the wink of an eye as it strikes. On top of the University of

Lightning strikes between clouds across Chicago's skies. Instrument traps are set up to photograph lightning bolts

St. Elmo's fire plucked hat from observer atop Pikes Peak, made his fingers spark and knocked him from roof

Pittsburgh tower in 1947, for example, the engineers trapped a superbolt, believed to be the largest ever recorded. The bolt consisted of five separate surges, at least one of which contained an estimated 345,000 amperes of electricity—enough to service 200,000 homes!

Despite this research, scientists still are far from being able to predict the vagrant whims of the storm cloud. There is an average of 10 lightning strokes per square mile in the United States each year. Any one of these strokes may produce some wacky results.

About a year ago a bolt struck a church belfry in Maryland. It surged through the automatic chime system, short-circuited key wires and touched off a long program of church hymns. Another stroke belted a potato patch; when the spuds were dug up they were fully roasted and ready to eat.

Tricks on Pikes Peak

Such strokes are weird, but for some of the weirdest electrical phenomena ever witnessed, leaf through the journal of the first weathermen ever stationed atop Pikes Peak. Entries in the diary were made as far back as 1874. The journal was found recently among some old records at the High Altitude Observatory in Boulder, Colo., by Dr. Walter Orr Roberts and Kathryn Virnelson of the observatory. It is replete with descriptions of bristling mustaches and sparkling fingers—St. Elmo's fire playing its tricks.

Robert Seyboth, the weatherman in charge, and 13 men from the Signal Service started the highest weather station ever established up to that time. They probably would have been leery of the job if they had known the strange events they were about to witness. They settled down in a fortlike structure of stone set solidly on a ridge near the summit of Pikes Peak. On the roof of the dwelling was a standard wind vane and an anemometer, whose whirling cups measured wind velocity. Inside the building was a barometer. A telegraph key served as Seyboth's link to the world far below.

The worst hazard to life on the summit was not wind, cold or snow, but the violent electrical storms. To make measurements on the wind vane and anemometer the observer had to climb up on the roof.

Hair-Raising Experience

On the night of June 9, 1882, the observer noticed that as he ascended the roof his fingers were tipped with fire. Suddenly every hair on his head stood on end and crackled. About him was the peculiar odor of ozone. The sensation of electrical discharges jumping from his fingers became painful and the prickly sensation on his scalp unbearable. To protect his head he tried to put on his black felt hat. The hat was about two inches from the top of his head when a fiery stroke knocked him from the roof. Still alive, he picked himself up and beat a glowing retreat to his quarters.

The report for one summer day states: "Heavy thunder and lightning nearly all day. Bright sparks flew around the office, so that several tourists wrapped themselves in blankets for protection." The tourists probably were no more frightened than one observer who, with true scientific detachment, noted that during a thunderstorm his pulse increased from a steady 76 per minute to 120 per minute, and his heart seemed to be pounding rather than beating!

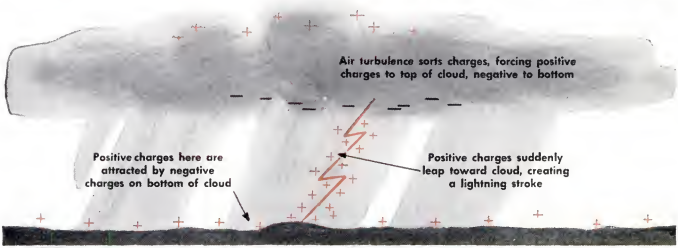
Flashing Telegraph Wire

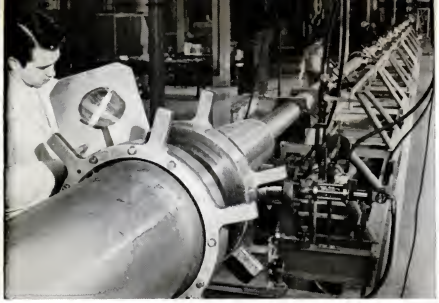
Another observer reported: "During the fall of sleet a peculiar 'singing' or 'sizzing' noise on the telegraph wire was distinctly heard. At 8:45 p.m., upon opening the door, a most curious and beautiful phenomenon was seen. The telegraph line on the summit was distinctly outlined in brilliant light, which was thrown out from the wire in beautiful scintillations. On near approach to the wire these little jets of flame could be plainly observed. They issued from the wire in little streams about the size of a lead pencil, and of the brightest violet color. They were constantly jumping from point to point. There was no heat, though it was impossible to touch one of these little flames, for as soon as they were approached by a finger they would instantly

(Continued to page 236)

Bolt in lightning lab shows that a golf club with a steel shaft can actually become a lightning rod

Lightning dug this furrow in ball park, killing three players. Below, theory of lightning origin

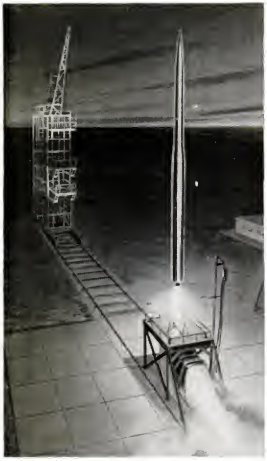




Metal diaphragm placed between tank and end of tube is ruptured on scored lines as gases explode into tube

Blast Wave Speeds at 18,000 Miles Per Hour Through Shock Tube

Guided-missile scientists can now create a shock wave that travels at 18,000 miles per hour and is accompanied by a temperature of 15,000 degrees—1½ times the heat at the sun's surface. The blast and heat last only an instant, but are enough to reveal the effects of the earth's atmosphere on a rocket or satellite traveling at 25 times the speed of sound. A near vacuum is created in the 100-foot-long, four-inch-diameter shock tube before the test begins. A huge cylinder at one end is pumped full of gases until pressure reaches 2000 pounds per square inch and bursts a metal diaphragm to send the shock wave racing through the tube and into a shock-absorbing expansion tank at the opposite end. Pressure-sensitive instruments and an electronically operated camera record the blast. Upon firing, the firing tube recoils.

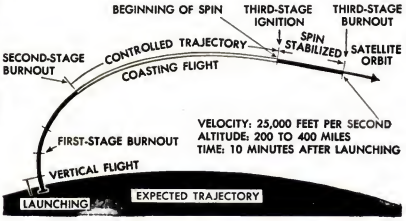


Artist's drawing shows the launching platform and the rail-mounted tower which will be used to service the satellite rocket. Diagram shows the anticipated trajectory of the satellite until it enters its orbit traveling some 25,000 feet per second

Satellite Rocket Will Resemble Shell

Few details have been released on the earth-satellite project, but an artist's conception shows that the three-stage rocket will resemble a giant rifle shell complete with bullet. The drawing, along with information on the trajectory, was released by the Navy and the Martin Company, which is building the rocket vehicle.

The first-stage rocket is about 45 feet long. It will carry the vehicle to an altitude of 30 or 40 miles, then drop off. The second stage has a cone-shaped nose which, during burning, will be jettisoned. By this time the satellite will be at an expected altitude of 200 to 400 miles, and the third stage will boost its speed to about 18,000 miles per hour. The satellite probably will be separated from the third-stage shell, though both satellite and shell will continue in the orbit until atmospheric drag causes both to drop and burn.



Thin stubby wing of Starfighter gives it appearance of missile. Wing tanks can be added for greater range

F-104A Starfighter Is World's Fastest Combat Plane

Wings are disappearing from planes and soon will follow the guy wire into oblivion. That was proved when Lockheed unveiled its supersonic fighter, the fabulously fast F-104A Starfighter. Wings on the Starfighter reach only 7½ feet from fuselage to tip, are 5 inches thick at the root and 2 inches thick at the tip. The leading edge is razor-sharp and must be covered with a felt pad to protect the ground crew while the plane is in the chocks. Described as the fastest combat plane ever built, the F-104A is estimated to have a top speed of better than 1500 miles per hour—which is nudging against the thermal barrier. A British Fairey Delta 2 holds the official world speed record of 1132 miles per hour, set on March 10, 1956. Pilots watching the first demonstration flights of the F-104A were amazed to note that its speed in a climb was equal to its speed in level flight. Power is supplied by a General Electric J-79 engine delivering an estimated 15,000 pounds of thrust—the equivalent of 60,000 horsepower at 1500 miles per hour. The plane has gone into production for the Air Force in both single and twin-seat models and will soon be delivered in quantity. All flight data is highly restricted, but estimates give the F-104A a combat radius of 800 miles, an outside range of 2200 miles, a flying weight with wing tanks of 19,000 pounds and a service ceiling of 60,000 feet. Engineers point out that it weighs about half as much as presently operating fighters, yet has more punch plus tremendous speed. One feature is downward ejection for the pilot in the event of a bailout. In an emergency, the pilot pushes a button; automatically he is strapped into the seat at the ankles, the cockpit is depressurized and the seat is shot out the belly of the plane. At a safe distance, the pilot is automatically separated from the seat.

Ocean-Liner Model

Antoine Paya, a mason of Bordeaux, France, has built a six-foot model of an ocean liner from sheet metal that he riveted and bolted together. A gasoline motor geared to four forward speeds can push the boat along at 12 miles per hour. The craft has seven turrets, seven hoists and seven lifeboats, all operating perfectly. There are also 12 winches, 180 cabins, 80 portholes, 160 small rooms, three promenade decks as well as seven stairways.

A FIRST IN AUTOMOTIVE HISTORY:

WE DROVE A TURBINE CAR COAST-TO-COAST

By George J. Huebner, Jr.
Executive Engineer, Research, Chrysler Corporation

OUR TURBINE CARAVAN was rolling along the Pennsylvania Turnpike at about 55 miles per hour. Dashboard gauges showed everything to be normal. Suddenly, a state-police car pulled up alongside and signaled us to halt.

I swung the Chrysler Turbine Special over to the side of the road.

"What's wrong, officer?" I asked.

"Nothing," he answered with a grin. "We just wanted to see what's under the hood."

And he was typical of hundreds of curious folk from New York to California. They just wanted to see what was under the hood of a conventional-looking 1956 Plymouth that rolled past with a new sound in automotive engineering—the smooth, steady whine of air in continuous motion.

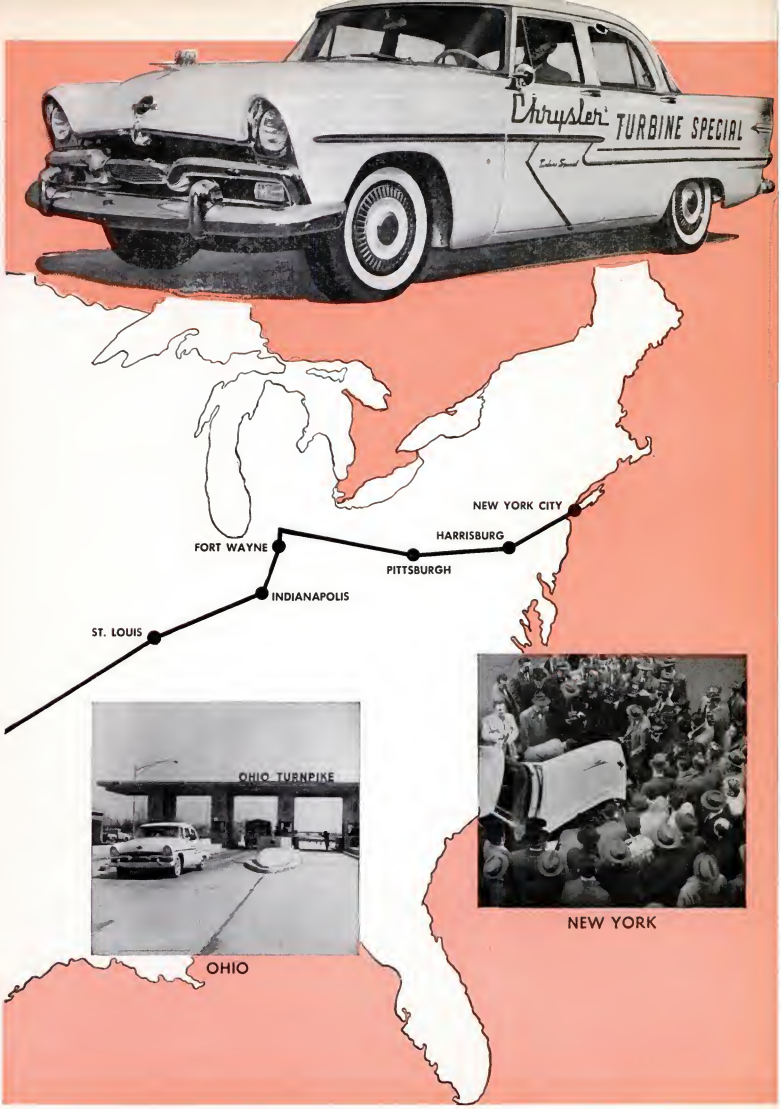
More often than not, however, they went away wondering what all the fuss was about. The gas-turbine engine they saw was so different from what they were used to that it must have left them unconvinced.

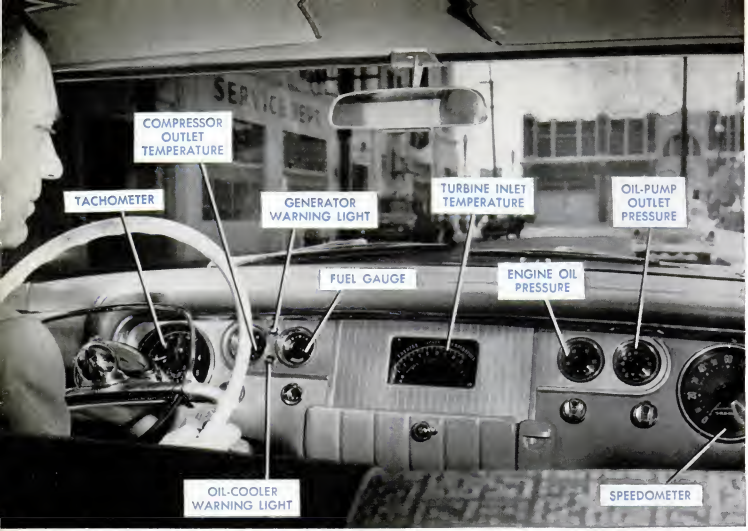
But what they saw was an engine that may well revolutionize the auto industry within 10 years. After driving the turbine car from coast to coast in four days—four days with varied weather and traffic conditions—I am more convinced than ever of the gas turbine's potentialities.

The turbine engine we used develops 120 horsepower, yet is comparable to the propulsion power of a piston engine of about 165 horsepower because it needs fewer power-draining accessories like water pumps, fans, mufflers and automatic transmissions. It is 215 pounds lighter than

CALIFORNIA

ARIZONA


Chrysler TURBINE SPECIAL
NEW YORK CITY
HARRISBURG
FORT WAYNE
PITTSBURGH
INDIANAPOLIS
ST. LOUIS
OHIO TURNPIKE
OHIO
NEW YORK



Some of these instruments are for engineering purposes and would not be installed on a production-line car

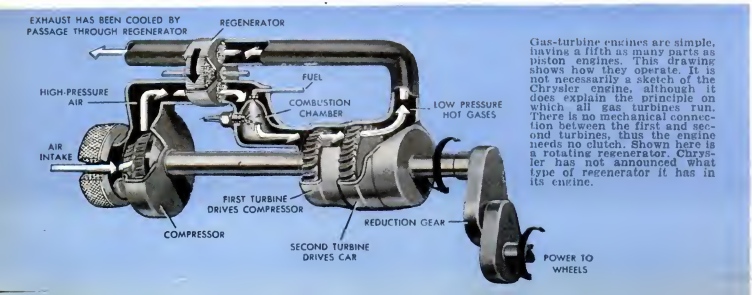
the equivalent piston engine and has only a fifth as many parts.

It needs no carburetor, no distributor. It has no complex ignition system. Once the fire is started by the single spark plug, it maintains itself and the plug no longer sparks. It has no radiator because it cools itself with the air it breathes as it runs. It is, in fact, a true aircooled engine, cooling itself internally. It takes in over six times as much air as it needs to burn the fuel. This extra air keeps the engine from burning itself up. It lowers the combustion temperature of the gas from about 3500 degrees (which would burn up any metal we have) to about 1500 degrees before it hits the turbine. This air rush also insulates the combustion flame, keeping it from touching the walls of the combustion chamber. The walls would melt if subjected directly to the flame which is like a huge blowtorch.

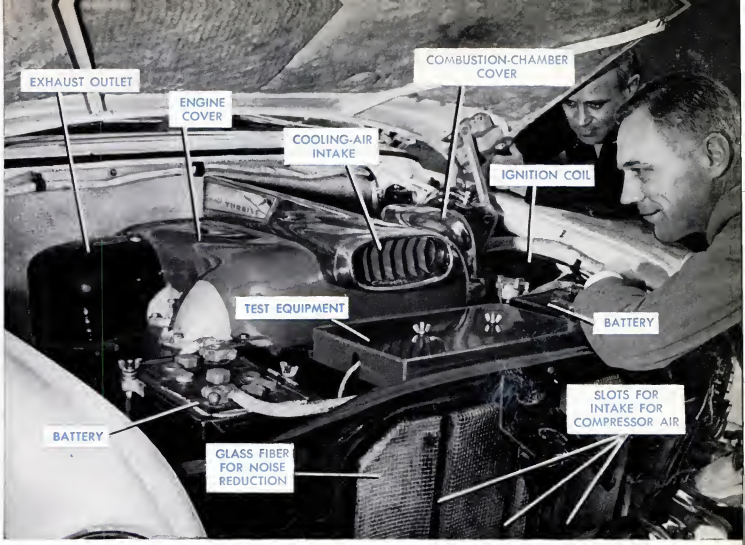
This engine has no muffler, yet its noise is no more objectionable than that of the conventional piston engine. It needs no muffler because it has no noisy explosions to be muffled. Its power comes from the continuous burning of fuel under pressure.

Our experimental turbine has a characteristic whine—a combination of the sound of vast quantities of air being drawn into the compressor and the sound of the reduction gear. We have already been able to cut the reduction-gear whine drastically and expect to reduce air noise by acoustical treatment in subsequent models.

We averaged about 45 miles per hour during the coast-to-coast run. Most of the time we drove at around 55 miles per hour. Ed Mason, Chrysler's chief engineer of mechanical research, spelled me at the wheel.



Gas-turbine engines are simple, having a fifth as many parts as piston engines. This drawing shows how they operate. It is not necessarily a sketch of the Chrysler engine, although it does explain the principle on which all gas turbines run. There is no mechanical connection between the first and second turbines, thus the engine needs no clutch. Shown here is a rotating regenerator. Chrysler has not announced what type of regenerator it has in its engine.



George Huebner, right, looks under the hood of the Turbine Special, the car he describes in this article

While one of us drove, the other flew to the next changeover point to sleep before the car caught up with him. Other crew members worked in relays.

Our caravan was pretty much self-sufficient. We had a truck carrying spare parts (we needed them only twice) and a supply of gasoline. The turbine will burn just about any type of fuel, but we used white, unleaded gasoline exclusively. Once we refueled at a commercial filling station, the rest of the time we drew on the stock in the truck.

We averaged between 13 and 14 miles per gallon. With kerosene we might have averaged 18 miles per gallon because of its higher heat content. But we wanted to stay with a fuel you may be using in tomorrow's turbine. Kerosene is not abundant enough to supply millions of cars. The ultimate automotive turbine fuel will probably be a blend of several petroleum fuels.

In Ohio, an overheated bearing in the reduction gear (the result of an oil leak) was replaced in 2½ hours

In Arizona, a cracked casting was replaced and the entire engine taken down for inspection in 5 hours

Test instruments were mounted on rear seat. Radiotelephone kept contact with other cars in caravan

Three cars of the caravan wait at a grade crossing. The Turbine Special ran smoothly in heavy traffic

What is it like to drive a turbine car? It's exciting not only because you realize you may be driving the car of tomorrow, but because it is so smooth and so much under control. It is amazingly quiet. First, there are no explosions, but more important is the fact that there are no vibrations created by such reciprocating parts as valves, pistons, rocker arms and all the other machinery that make up a piston engine.

It is so quiet inside the car that you become aware of road noises you have never heard before. This, incidentally, poses an exciting challenge to our chassis engineers. It is so quiet and smooth that I can say it is like being towed on the end of a rubber rope.

There have been stories that turbines are fine for open highways, but won't work in today's traffic. I drove the turbine in mid-morning New York City traffic and in early-morning Los Angeles Freeway traffic and we didn't seem to hold up anybody. And remember that this engine is not the one we will offer the public. This is the beginning, but a most successful beginning.

We did have some trouble. Twice we had to stop for repairs. Neither breakdown involved any flaw in the basic turbine design. The first trouble was in central Ohio where a bearing overheated in the reduction gear (the only transmission the car needs, by the way). We were losing oil through a cracked oil line and the lubricant shortage scored the bearing. We replaced line and bearing in 2½ hours.

The second trouble came at Winslow, Ariz., where we noticed an unusual hissing noise and discovered a crack in the compressor-intake casting. We decided to change the casting and check over the entire engine. It took only five hours to tear down the power plant and put it together again.

To drive a turbine you turn the ignition key, as usual. This produces a steady spark in the single spark plug and also switches on the starter motor. You let the key snap back to its normal position. The starter winds up the engine.

When the compressor section reaches a speed of 2500 revolutions per minute, fuel sprays into the combustion chamber. The spark ignites it and the burning, expanding gas helps the starter spin the turbine wheel and compressor. The starter still operates

(Continued to page 252)

Fuel was drawn from a supply truck that accompanied the test car. It used only white, unleaded gasoline

Filler pipe for gas tank is inside trunk. Exhaust duct occupies space where filler is on standard car

Designed by Monorail, Inc., 4118 Fannin, Houston, Tex.

Monorail exhibit drew thousands. Height of rail at loading point is 10 feet. Standard operating height is 30

First U. S. Monorail Has Trial Run

AMERICA'S first monorail train is undergoing tests on a 970-foot pilot line in Houston, Tex. Hailed as one answer to America's urban transportation problem, monorails have proved fast, safe and economical in European use.

The 55-foot Houston train is in two parts: power units and engineer's cabin on top of the rail, and passenger coach below. The rail is a steel pipe 30 inches in diameter, supported by inverted-J towers that are 30 feet high and spaced 55 feet apart.

The train rides on eight rubber-tired wheels while 16 rubber guide wheels hold it in place on the rail. Two 305-horsepower gasoline engines drive the unit, which someday may achieve a speed of 250 miles per hour.

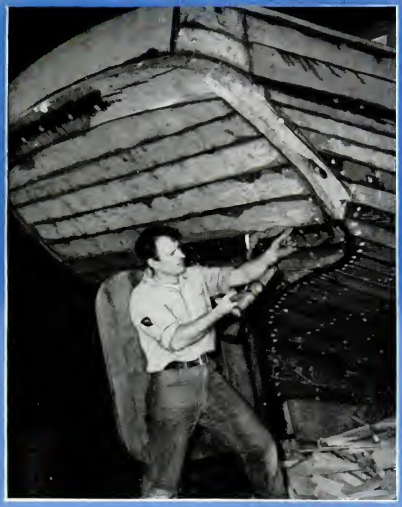
The glass-fiber coach seats 60 and stands 50, is seven feet high and eight feet wide inside.

A monorail line, backers say, could be built at the rate of one or two miles per week for $500,000 per mile. That's over twice the cost of a regular railroad but 1/12 the cost of a subway. A two-track line would cost $700,000. Chief advantages: it takes no right-of-way, can operate above a busy street.

Coach seats 60 and carries 50 standees, is 7 feet high and 8 feet wide inside. It is suspended from power units that run on top of the rail. Pilot model has glass-fiber skin

INDIAN OCEAN
MADAGASCAR
AUSTRALIA
TORRES STRAIT
JULY 4, 1897
ASIA
AFRICA
DEC. 25 1897
ST. HELENA
EUROPE
NORTH POLE
SAMOA
NEW ZEALAND
ATLANTIC OCEAN
BOSTON
START—APRIL 24, 1895
FINISH—JULY 3, 1898
NORTH AMERICA
MARQUESAS ISLANDS
PACIFIC OCEAN
EQUATOR
SOUTH AMERICA
STRAIT OF MAGELLAN
APRIL 15, 1896

Map shows round-the-world route taken by Slocum 60 years ago. Carr hopes to match his feat with replica of the *Spray*

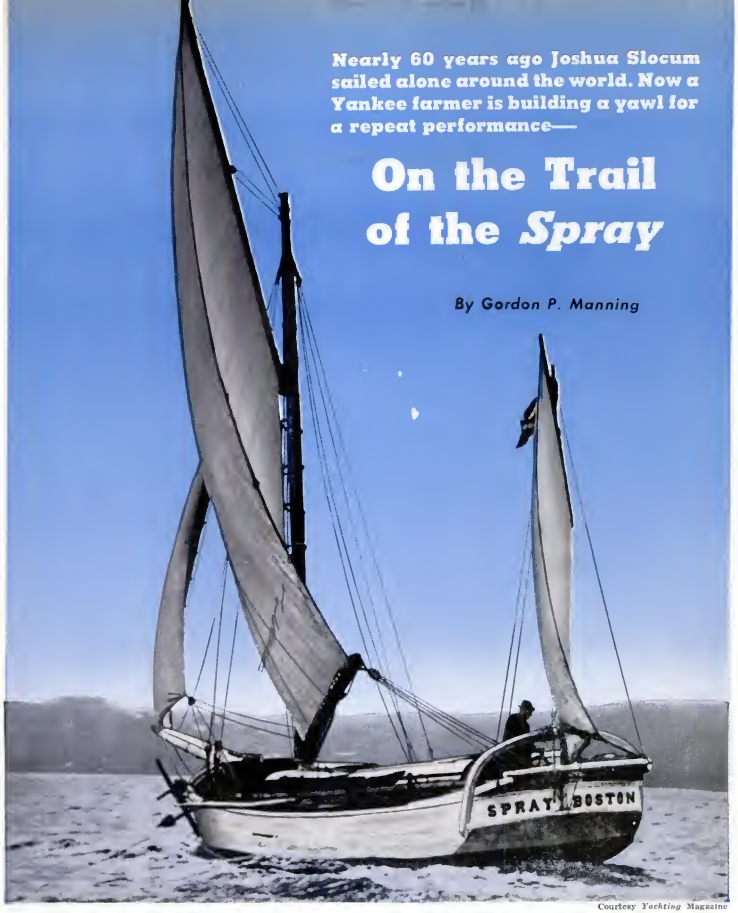


There were over 1500 feet of seams to be calked in the hull alone. Job took several weeks. Carr uses old-time building methods

Nearly 60 years ago Joshua Slocum sailed alone around the world. Now a Yankee farmer is building a yawl for a repeat performance—

On the Trail of the *Spray*

By Gordon P. Manning



Courtesy *Yachting* Magazine

This is the boat Joshua Slocum sailed around world. Here it is rigged as a yawl, as will be Carr's replica

SPURRED ON by his dream, a 39-year-old farmer from the hill country of Vermont, 20 miles from the nearest water, is today completing a most remarkable deep-water sailboat. It is remarkable because it has been built entirely by hand, by one man, over a period of four years, without the benefit of power tools or equipment. Robert Carr of Monkton, Vt., is right now putting the finishing touches on his 36-foot yawl, a perfect replica of the *Spray* in which the famous Capt. Joshua Slocum cruised alone around the world, just before the turn of the century. The trip lasted more than three years, and young Bob Carr dreams of the day when he, too, will head his small craft into the faraway harbors of the world.

Carr has elected to build his ship in the manner of his forefathers—with a few simple tools, like the saw, adz, chisel and bit. Visitors looking for his workshop have

Photos by Ernest Swanbeck

Hull stands ready for outside planking. Bulwark frames are just being installed above deck line. Below, Carr uses an adz to dress down oak elbow

difficulty finding it, due to its diminutive size. When they do, they are amazed to discover only a few basic hand tools—not a power tool among them. For that matter, there is no electricity on Bob's farm, either.

Now, after four years of almost continuous labor on the craft, all that remains is to finish calking the hull, paint the ship and haul her overland to Lake Champlain for the launching. Masts, rigging, sails, cabin and hull are complete awaiting the great day. Once out in Lake Champlain, Carr will rig and outfit her near Burlington, test her, and then head south through the Champlain Barge Canal into the Hudson River. From there he will go down to the open sea.

It's an Extraordinary Craft

But let's take a look at this extraordinary sailboat which is now being built in a crude shed on Bob Carr's back-country farm in Vermont. The *Sirius* (as he has named her after the brightest of the stars) measures 36 feet long, has a beam of 14 feet and a draft of 7 feet, following exactly the dimensions of the original *Spray*. She has a large cabin aft, which will be Bob's living quarters, containing bunk, galley and head, with plenty of space to store huge quantities of food and provisions. Up on the forward deck is a cargo hatch opening on a large hold which can be used for commercial cargo if he ever wants to carry it. A door in the bulkhead connects the two areas. On deck, a neat, homemade dinghy rides upside down between cabin house and hatch, protected from wind and wave. For drinking water, he will use the old-fashioned oak water cask lashed on deck.

The high bulwarks of the *Sirius* will make it easier to walk around during bad weather and cut down Carr's chances of being washed overboard. He steers the

Each bolt and nail on exterior planking of hull was painted, countersunk and plugged with a wooden plug

White-oak rudder has bronze bearing at foot of its six-inch post. Horizontal pins tie blade to post

craft from the wheel just aft of the cabin, and through two ports in the cabin end he can see his inside compass in all kinds of weather. She is rigged as a yawl, and Bob is fitting everything out to be easily handled by him alone. His anchors are mounted in convenient spots on deck up forward, where at a moment's notice he can cut the lashings and they will drop overboard. There will be no motor in *Sirius,* because Bob Carr is one sailor who hates gasoline. When you ask him how he expects to get along without a motor, he answers, "If Captain Slocum didn't need a motor, why should I?"

Bob took his plans from a little drawing which he found in Slocum's book, *Sailing Alone Around the World.* The minute drawing showed the profile, plan view and several sections. He enlarged these to full-sized working drawings, which he then made fair and smooth in his own mold loft. By this last step he assured himself of a proper hull when his work was finished. Experts who have seen the boat and studied the lines say it will be exactly like its famous predecessor, right down to the size of each spar in her rigging, the thickness of every plank and the shape of the hull.

(Continued to page 242)

Carr completes calking of deck seams on the forward deck. Behind him is windlass. Cabin top is in foreground

Dangling on the face of the precipice, the workman uses a long steel bar to break away loosened rocks

Spring Cleaning *on an* Alpine Highway

DANGER! FALLING ROCKS. The Swiss, a painstaking people, spring-clean their mountain highways each year to minimize such dangers.

With an eye to the tourist trade attracted to the William Tell country by its rugged mountain scenery, the Swiss spend much time and money to prevent rockfalls.

Before the spring thaw, highway workers dangle over precipices breaking off all loosened rocks that are potential dangers to motorists on the highway below.

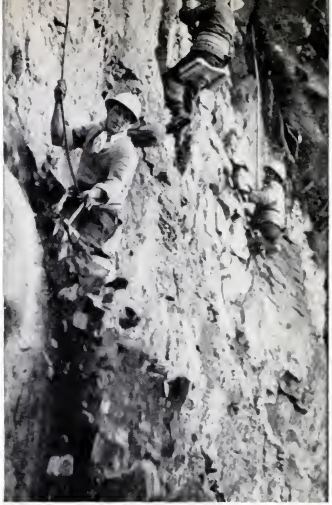
The work is arranged so only small sections of the highway are blocked at one time since it must be done in daylight when traffic is heaviest.

Shown here are scenes along the famed Swiss Axenstrasse, the great Alpine scenic highway hewn out of rock through the rugged mountains into Italy. ★ ★ ★

Despite intense preventive action, landslides sometimes occur, carrying away sections of the Alpine highway

Birnback photos

So tourists won't be delayed too much, the Swiss use the most modern equipment to repair damage quickly



By knocking away these loose rocks and debris, the workmen minimize number of dangerous landslides

At times traffic is held up while overhanging rocks are broken loose and sent tumbling down onto the highway

Detroit Listening Post

By Leo Donovan

IT'S OPEN SEASON on predictions. Everybody's doing it—making statements about gas turbines, free-piston engines and even atomic power plants. There seems to be little mention of fuel injection these days—maybe because it's too near.

Chrysler does not deny the rumor that its entire lineup of 1957 cars (from Plymouth to Imperial) will have torsion-bar suspension in the front end. Such a change would make Chrysler the second major American producer to go to torsion bars, Packard having brought out a full torsion-bar suspension in 1955. The Chrysler bars run about half way back on each side. Nobody seems willing to guess why the changeover, but it may be that more space is needed in the engine compartment. Or it could be simply that it's better.

The luxurious Imperial will have its own body next year, rumor has it, to improve its attraction in the fine-car field. The 1957 300 (presumably the 300C) will also have its own styling treatment but won't be out until early in 1957.

By the way, it is now generally agreed that all the 1957 cars (except specials like the 300) will be out by the end of November. A national automobile show in New York City early in December makes it imperative for everybody to be ready by then.

Air Suspension for 1957?

The air-suspension rumor continues, despite denials from on high. Spies report that Cadillac will be first in the domestic passenger-car field with air suspension. The system will be a modification of the highly successful suspension used by GMC on buses. Cadillac may have a new and different rear axle, these same spies say.

Lincoln is reported to be preparing an ultraswank model as it continues to try to break into the Cadillac business. The Continental Mark II will have refinements, but no basic body changes for 1957.

Most industry forecasters seem to feel that Pontiac and Chevrolet will be given only major appearance changes and that the big year for these two is 1958. It is known that the big cars, Cadillac, Buick and Oldsmobile, will be all-new for 1957.

There is still talk about moving the transmission to the rear end, mainly as a styling aid to eliminate the big hump in the front floorboard (and also, of course, to improve weight distribution).

Apparently such a move would introduce other problems more serious than the hump. Now the story is that half the transmission will go to the rear and half will remain up with the engine. The torque converter, being a narrow doughnut, can be snuggled against the engine while the more bulky gearbox and control mechanisms are moved to the rear axle. A few lengths of tubing are all that is needed to pipe oil back to operate the controls.

The 1957 Chrysler lineup of cars is expected to be even lower than anticipated. Speculation is that they will all be as low as the Jaguar hardtop coupe. Seems hard to believe. One observer who saw a 1957 Chrysler drive by (well shrouded with slip covers) claims the car is low all right, but not that low. So take your choice. The slip covers couldn't hide the rakish tailfin shape. If you like fins, you'll love Chrysler. This lowered body means step-down design. Remember when Hudson had it?

Free-Piston Engine

General Motors announced a free-piston experimental automobile recently. It has no thirst problems, being able to burn just about anything from whale oil to peanut oil. If you would like a detailed explanation of the principle, dig out your *Popular Mechanics Magazine* for September 1950 and read the "Revolution of the Free-Piston Engine." It tells the whole story.

General Motors modified the usual design by a Siamese arrangement with four cylinders instead of the conventional two. This was done to make the engine compact enough to fit under the hood of an automobile. Little is known about the car's performance because there was no time for road or track tests before announcement.

There is a big hassle over the relative merits of gas-turbine and free-piston engines. You'll find supporters of each.

Another reliable rumor is that there will definitely be fuel injection in the 1957 models—but not in the regular models. One company is planning to offer it on its high-performance car that will be introduced in February or March 1957.

It is also pretty well established that windshields will wrap upward as well as sideways on the new bodies. With more glass area and less headroom, motorists are going to be forced into wearing caps. Better get into the cap business!

The Panama Canal lies open and exposed to attack by modern bombers. Ships wait in line for their turns to thread its outgrown passage from sea to sea. A Chilean engineer proposes a solution to the growing problem:

WHY NOT BUILD A TUNNEL FOR SHIPS *From Atlantic to Pacific?*

By Jorge Cortinez Delfino
Engineer, State Collective Transportation Company, Chile

AT THE TIME the Panama Canal was built it was a tremendous engineering project. Planners expected the Canal to serve the needs of shipping for all time. The locks were built 1000 feet long and 110 feet wide in the belief that they would handle any ship ever built.

Today there are several merchant vessels afloat that are too large to pass through the locks. In addition, there are several ships in the United States Navy that cannot pass through the Canal, and others are under construction or planned that will be much too large to navigate the waterway. This severely restricts the military use of the Canal, the purpose for which it was built. Also,

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Tunnel would stretch across narrowest part of Costa Rica. One canal would carry traffic each way. In center would be a railroad tunnel which, during construction, would carry away excavated material

the Canal is difficult to protect from air attack.

One other factor to be considered is the tremendous flow of traffic through the Canal. Ships now may wait for days for their turns in the locks.

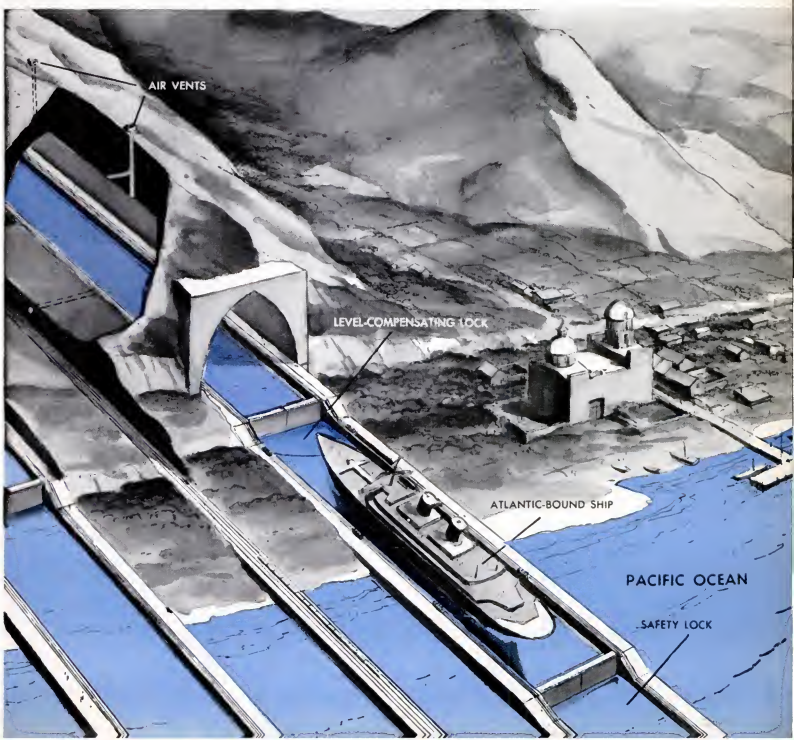
What can be done to solve these problems? Several proposals have been under study for years. Under one plan, additional and larger locks would be built at some distance from the present ones. However, this project would result in certain navigational hazards because of unavoidable sharp turns in the new channel. Also, the Canal would be as open to enemy attack as it is as present.

Another proposal is to convert the Canal into a sea-level one. In this case, all locks would be eliminated except for a small tidal lock which would control the differences between the tides in the Atlantic and Pacific. This would reduce the upkeep and permit more ships to negotiate the Canal. However, it would require the construction of many miles of dams to divert from the Canal the torrents of water during the rainy season. And again the Canal would be relatively open to enemy attack.

New Sea-Level Canal

A brand new sea-level canal somewhere on the isthmus of Central America would solve many of the problems. Several studies have been made of possible locations. Sites have been suggested across Nicaragua, Mexico and another area of Panama. Such sea-level canals, regardless of their location, still do not solve the problem of enemy attack.

My Chilean compatriot, Roberto Gomez Alvarez, and I have proposed a plan which we feel will solve all the problems of ship transit between the two oceans. This plan has been studied and approved by engineers and topographers of recognized standing in the Western Hemisphere. United States Army and Navy engineers have also studied the proposal, and it has been called to the attention of the United States Congress.



Today a ship must wait its turn to pass through Panama Canal. Some naval ships are too big for the locks

In essence, the proposal is to *tunnel* a sea-level canal through the mountains of Costa Rica. More accurately, two tunnels would be built, one to move ships from the Atlantic to the Pacific, the other for transit in the opposite direction.

Toward that end, we are seeking to obtain from the government of Costa Rica the concession of a strip of territory five miles wide from coast to coast (about 50 miles long). Elements of the press of Costa Rica have given their support to the project, which would be a source of permanent income to that country.

Two tunnels would be built about 600 feet apart. Between them, and as a supplement to both, would be a railroad tunnel.

Trolleys Pull Ships

Each tunnel would be egg-shaped with its narrow end at the top. A platform on each side would accommodate the electric trolleys which would pull the ships through the tunnel. It would be impossible for ships to proceed under their own power because of the problem of ventilating the poisonous fumes from their huge engines.

The railroad tunnel would serve from the beginning of construction as a pilot tunnel, and would play an important part in the removal of the tremendous quantities of earth and rock which would have to be excavated.

The terrain selected for this gigantic engineering job is of volcanic origin thousands of years old. Its solidity is unquestioned. To eliminate the chance of minor rock slides within the tunnels, the arches would be covered with two-inch steel rods and a layer of concrete 40 inches thick.

It is quite possible that much of the cost of excavation would be paid by the excavated material itself. The site is close to known deposits of petroleum and uranium.

Ventilating the tunnels poses problems, but not insoluble ones. Vertical chimneys would be drilled about every 1500 feet. Horizontal air-injector pipes would be built into the tunnels. Air brought in through these pipes would be exhausted through the chimneys.

Two Generating Plants

It would be advisable to build two generating plants, one at each end of the tunnels, to provide electricity for lighting the tunnels, powering the trolleys and serving the settlements for personnel who would work in the tunnels.

The excavated material would be used to build two artificial ports, one at each end of the waterway. These not only would protect the boats, but also the entrances to the canals.

Compensating locks probably should be built at each end of the tunnels. These would maintain a constant water level within the tunnels and protect them against strong currents from the ocean.

What are the advantages of this proposal? It is obvious the tunnels would be free from storms, collisions, navigational hazards and fog. Fog, incidentally holds up all traffic through the Panama Canal many times during each rainy season.

One of the primary advantages would be the relative ease with which the canal could be protected from enemy attack. It is true that the compensating locks could be destroyed or damaged. However, the protection of these two small areas is a far different problem from protecting a canal for its entire length. And it seems quite possible that the tunnels would still be navigable even if the locks were destroyed, though navigation might be considerably more difficult.

Someday, perhaps, we will see ships moving along beneath 5000 feet of solid volcanic rock. Statesmen, engineers and laborers will have answered the question: Why not build a tunnel for ships? ★ ★ ★

Above, Russian TU-104 at London airport. Below, the new Boeing 707, is larger, faster and with longer range

Russian Jetliner Makes First Appearance in West

LATEST JET AIRLINER to make its public debut is the Russian Tupolev 104, a 50 to 70-passenger liner which recently brought an official party to London. Tagged at first as a startling advance in jet aviation, the TU-104 has been re-evaluated by aviation observers in the light of new information about its performance. The plane resembles the Badger, medium bomber of the Russian Air Force, and apparently some standard fuselage sections, such as the nose, are used in both planes. On the flight to London, the plane averaged 446 miles per hour, and may have a top cruising speed of 500. Cruising altitude has been announced by the Russians as 33,000 feet. Because the cabin is not as highly pressurized as are British and American jetliners, passengers will be required to wear oxygen masks, which hang beside each seat, when the plane goes over 37,000 feet. Range of the TU-104 seems to be around 2000 miles. Most surprising features of the plane were the jet engines, enclosed in nacelles 40 feet long. From Russian statements, and also from computations based on the size of the intake openings, air observers believe them to deliver around 15,000 pounds of thrust, equal to the latest British and American power plants. Thick wings and unclean fuselage lines keep the speed down in spite of the high thrust according to the experts. Observing the low speed, the payload capacity and range, airmen rate the TU-104 right along with the Mark II Comet—a medium-range, medium-speed plane as far as commercial airliners in international competition are concerned. The Boeing 707 and the Douglas DC-8, new American jets, will have cruising speeds of 575 miles per hour, ranges of 5000 miles, and passenger-carrying capacities up to 146. The British Comet Mark IV will cruise at 500 miles per hour carrying 58 passengers over a range of 2870 miles. It seems likely that the Russian plane will first see international service on routes between Moscow and the Scandinavian capitals.

Most Valuable Player ...the Catcher

By Lew Fonseca

Major-league player for 12 years; former Batting Champion of the American League; former manager, Chicago White Sox; now Director of Promotion, American and National Leagues of Professional Baseball Clubs.

Photos posed by Yogi Berra

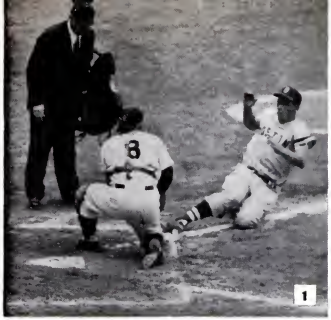
New York Yankee catcher; three-time winner of the American League's Most Valuable Player Award.

LAST YEAR Yogi Berra was named the most valuable player in the American League for the third time. In my opinion, this recognition of a great backstop is one of the finest things that has happened in baseball since Abner Doubleday blasted a hit across a cow pasture back in 1839 to invent the game.

For 12 years I was a major-league player, and a club manager for three. Since hanging up my spikes 20 years ago I have served as Director of Promotion for both the American and National Leagues of Professional Baseball Clubs. During this lifetime in baseball I have become convinced that the catcher is the unsung hero of the game. Too many spectators consider the catcher just another member of the team.

It's too bad this feeling seems to accompany the battered old ball gloves which are

Immovable object! Berra, one of the most rugged men in baseball, blocks plate with entire body, tags runner with both hands



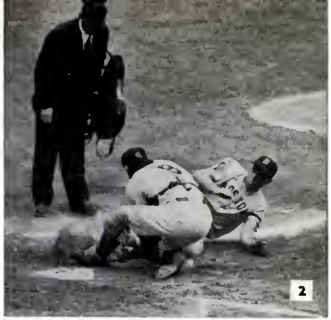


Photo series shows Berra's quick recovery. After tagging the runner, he's immediately ready for a throw to a base. Below, catcher wears about eight pounds of gear, may lose that much weight in game

passed down from father to son. Not enough catcher's mitts make that switch from big hands to little ones. Half a million boys between 8 and 12, to the everlasting credit of Little League baseball, now are playing ball. Toss a ball and bat onto the playground on that first warm day of spring and you'll be swept off your feet as these youngsters dash madly for every position on the field. Every position, that is, except the receiving station. Nobody wants to catch.

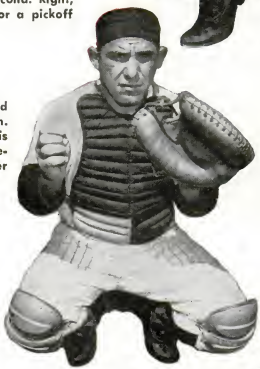
Yet this is the most fascinating position on the field. The catcher is one of the two men who are in on every play. He must be built for rugged action. He not only plays his own position but, in effect, every other position on the field, for he's the manager's right-hand man, the strategist, the field general. Matter of fact, he runs the show.

"Feel" for the Game

In addition to his playing ability, the catcher more than any other player must have an extra sense, a "feel" for the game. He must know the weakness, the strength,

Best signals are simple finger signs that won't confuse the pitcher. Deceptive signals may be necessary if there's a runner on second. Right, open palm can signal a pitchout for a pickoff

Basic posture during signals and before pitch is the full crouch. Catcher squats on the balls of his feet with about an arm's reach between himself and elbow of batter



Half crouch at left is used to receive the ball. Left foot is slightly in front of right, knuckles of right hand are toward the pitch. Right, Yogi uses entire body to block pitch in dirt or wide one

the blind spot, the thinking process of every batter. He must sense when a pitcher is tiring. He must anticipate the strategy of the opposing manager, sense when the hit-and-run, the bunt or the steal is on, and decide in a split second on his counter-strategy. He must hold the team together in the clutch.

And, last of all, he must be a good hitter to earn his place on the team.

Add up all these requirements and you get something of a superman on the diamond. There haven't been many such backstops in the business. The all-time greats would have to include Mickey Cochrane, Gabby Hartnett, Bill Dickey and Ray Schalk among others. From today's catchers you'd have to list Yogi, Roy Campanella and the promising Del Crandall. You go on from there.

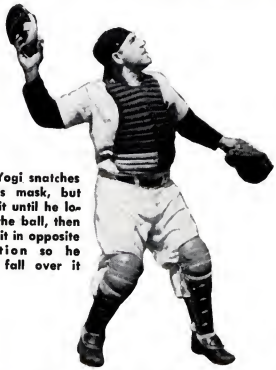
These are the hard workers who never "Jake" on the job. They literally sweat out the battle in the armor of their trade. Take Yogi as an example. He wears some eight pounds of equipment through many a blistering afternoon, and may lose just about that many pounds in catching a game. That, plus the fact that he must be the immovable object that guards the plate, is the reason the catcher must be a rugged man.

We recently analyzed the movements of some of the finest backstops in the business to produce a baseball film for the major leagues. This probably was the first comprehensive study of how top-notch platemen approach their craft. Any beginner can get a whale of a lot out of their recommendations, and any fan who watches the catcher at work can have twice as much fun at the ball park. Take a look at how the catchers say to catch.

Full crouch. The full crouch is your basic posture as a catcher. Squat on the balls of your feet with the legs spread comfortably, just as close to the batter as possible. (In the old days of baseball, the catcher stood far back of the plate and caught every pitch on the first bounce!) A good way to judge your position is to put a full arm's reach between you and the elbow of the batter. From this full crouch you give the . . .

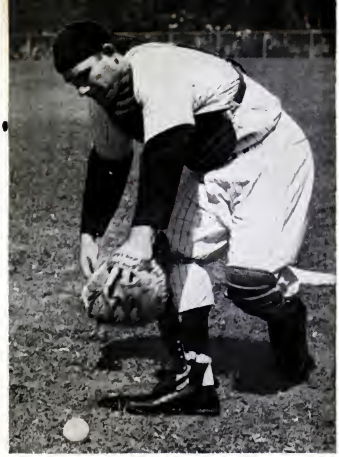
Signals. These are the sign language of

In playing a foul, catcher knows that the spin of the ball will make it curve back toward the infield. He always plays foul over his head, never walks or runs backward to catch it



Foul! Yogi snatches off his mask, but holds it until he locates the ball, then tosses it in opposite direction so he won't fall over it

Bunt! Instead of holding mask, Berra flips it back over his head as he strides forward. Below, popup is fielded overhead. Never watch high fly constantly



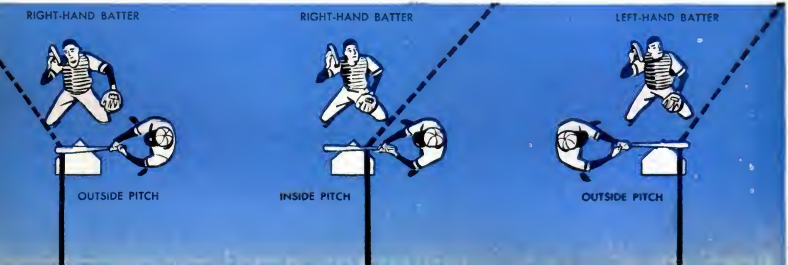
There's nothing flashy about Berra when he fields bunts but he's considered one of the best in the business. He uses both hands, comes up ready for throw

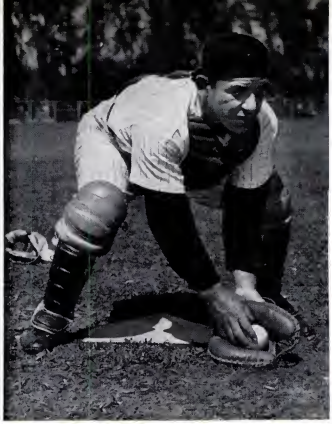
baseball. Use the legs and mitt to hide the signal. The best signals are the simplest. Use plain finger signs. Complex signals only tend to confuse the pitcher. However, a runner on second base can swipe your signals because he can see them almost as well as the pitcher. With a runner on second, many catchers give three different signals for the pitch, then a fourth signal to indicate which of the first three was the proper one. You can also set up a plan in advance: During the first three innings use the first signal, during the next three innings the second signal, etc. Main thing is to keep your signals and pattern as simple as possible. An extended thumb or palm can signal a pitchout if you plan to try a pickoff or if you feel the runner may be going.

Half crouch. After the signal, extend the mitt as a target for the pitch and rise to the half crouch. We've found that good catchers, regardless of build, have surprisingly similar half crouches. The spread of the feet averages two feet four inches, and the left foot is slightly in front of the right. This position will save you a split second in going after a foul or striding into throwing position.

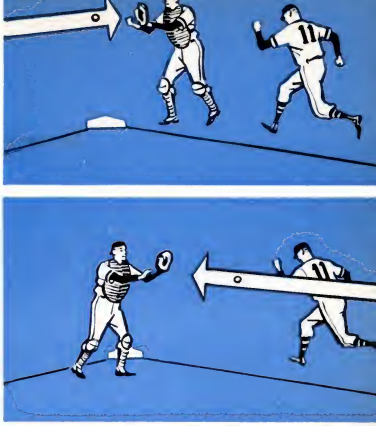
Catching the ball. Want to break a finger? It's easy. Hold the bare hand rigid, fingers pointing toward the pitcher!

Drawings show how batters tend to foul pitches. A good catcher senses which direction the ball is going as soon as he hears ball bloop off bat





In guarding home plate, Yogi makes sure he has the ball firmly in his glove, holds it with both hands



Catcher can't block plate until he has ball. Drawings show receiving position for throw from either side

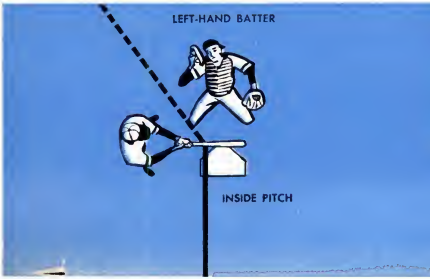
To avoid injury, hold your bare hand relaxed with the thumb curled inside the fingers and *the back of the knuckles toward the pitcher*. Any foul which strikes the bare hand then will bend the knuckles in their natural flexing direction.

On a pitch wide to the right, step out quickly with the right foot. Use the left foot in the opposite direction. *Never* cross your legs. For a ball in the dirt, go down on one or both knees. The main thing to remember is to get just as much of your body as possible in front of every pitch. Don't just reach out and snag the wild ones—get your whole body in front of them.

Catching foul flies and popups. This is an art that comes from study and long practice. In his amazing career, Gabby Hartnett muffed only one foul fly! You can use science to help you judge flies. It's a physical fact that a foul fly *always tends to curve back toward the infield* because of the spin imparted to the ball by the bat. This means you are actually catching a curve ball and must judge its trajectory.

(Continued to page 248)

Top-notch catcher may still be riding the bench unless he's a good hitter, too. Yogi is one of the most feared clutch hitters now playing the game



With two short handles in place, the cutting blade is held horizontal and used to trim hedges and bushes

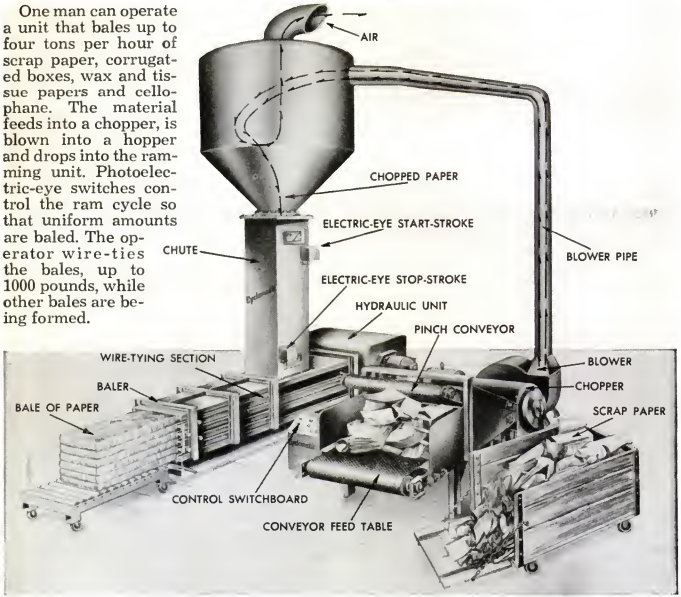
Equipped with long handle, blade is used in vertical position to edge lawn. Depth of cut is adjustable

Electric Tool Edges Lawns and Trims Hedges

With a new electric lawn tool you can trim and edge the grass as well as trim hedges and bushes. The tool is powered by a ⅛-horsepower motor developing 17,000 revolutions per minute. The cutting blade is adjustable for depth. The tool can be used horizontally as a lawn and hedge trimmer and vertically as an edger. It has a 4-foot handle for lawn work and two 16-inch handles for trimming hedges.

One-Man Paper Baler Chops, Blows and Bales Four Tons Per Hour

One man can operate a unit that bales up to four tons per hour of scrap paper, corrugated boxes, wax and tissue papers and cellophane. The material feeds into a chopper, is blown into a hopper and drops into the ramming unit. Photoelectric-eye switches control the ram cycle so that uniform amounts are baled. The operator wire-ties the bales, up to 1000 pounds, while other bales are being formed.



Tropical Fish Are Fun

By Richard F. Dempewolff

SILVERY, BLACK-STRIPED angelfish with swooping tendrils are staring at people through oval picture frames on living-room walls nowadays. Behind them, inside the wall, swaying water plants may hide a collection of other glamorous, rainbow-hued "tropicals"—lavender and blue-speckled pearl gouramis; darting, black-striped barbs; gold and black swordtails; odd-shaped hatchet fish from the Amazon; dazzling blue and red neon tetras from Brazil. If they don't like the view from the living-room side of their "bowl," they can try the other side and watch the antics

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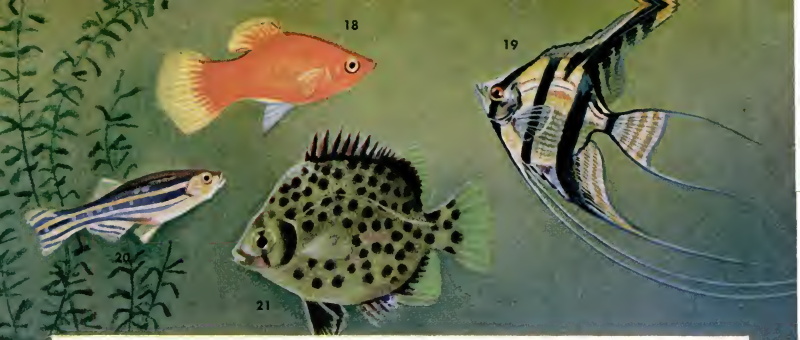
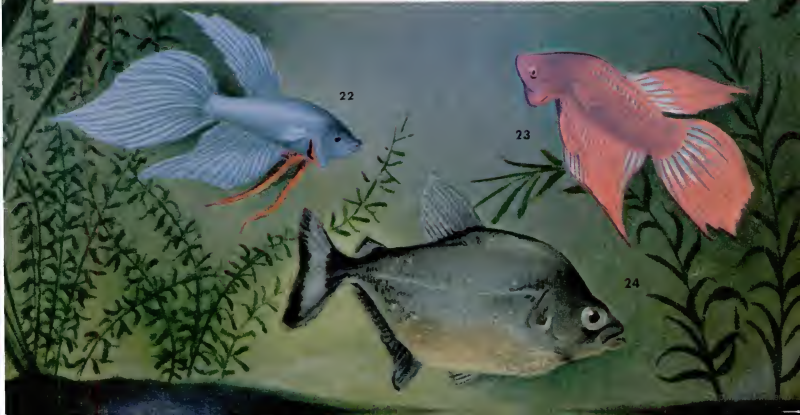


These are tropical fish for the home aquarium. Some are common; a few are rare and expensive. 1. Dwarf gourami; 2. Silver hatchet fish; 3. Gold wag platy; 4. Orange dorsal black sailfin molly; 5. Barbus Sumatranus; 6. Neon tetra; 7. Red swordtail hybrid; 8. Guppies; 9. Head-and-tail-light tetra; 10. Aqua-strain guppy; 11. Headstander; 12. Pompadour fish; 13. Kissing gouramis; 14. Black tetra; 15. Rasbora heteromorpha; 16. Plecostomus; 17. Corydoras aeneus; 18. Blood-red platy; 19. Angelfish; 20. Zebra fish; 21. Spotted scat; 22. Blue betta; 23. Red betta; 24. Piranha. Latter three must be kept isolated

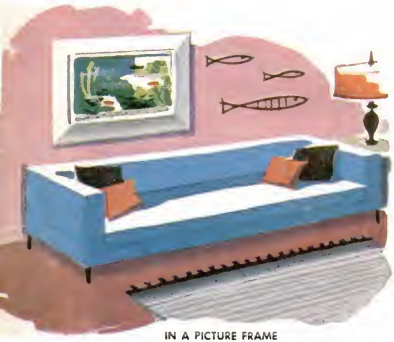
of people in the dining room. Here a second picture frame outlines the opposite side of this underwater wonderland. This new aquarium fits between the studs in an ordinary house partition.

Today's tanks — and the multicolored finny denizens in them — are a far cry from the narrow-necked bowls in which Grandma kept dime-store goldfish. Pet fish never had it so good.

Stroll through the humid, tank-lined corridors of such places as the Aquarium Stock Company operated by Len Berkitz and Lew Dalwin in New York and Los Angeles, or the grottoes of John and Elinor Groetzinger's Westchester Aquarium in White Plains, N. Y., and you think you're in a miniature world of Jules Verne. Fish glare at you from eerily illuminated windows in a score of unlikely places. A pair of white kissing fish, mouths stuck together like suction cups, hide behind swaying green fronds inside the top shelf of a modern step table. A school of striped barbs scurries through the skeleton of a wrecked galleon inside a mahogany radio cabinet. Whole families of mollies and guppies live in a big whatnot on the wall. Wrought-iron room dividers made up of tiers of tanks house special breeds of fierce, incompatible tropicals. Lights for one fancy aquarium are hidden under the sloping roof of a miniature Chinese pagoda on a wrought-iron stand. There are gleaming triangular tanks for room corners, octagonal tanks for anyplace, big tanks for the wealthy, little ones for beginners.



IN A CABINET



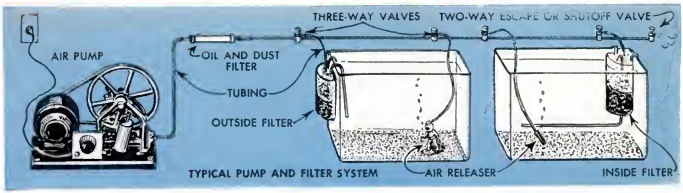
IN A PICTURE FRAME

No longer are bubbling aerators and filters just ugly tubes stuck inside the tank. Bubbles rise realistically from the helmets of brightly colored ceramic deep-sea divers or the stacks of "sunken vessels." Dalwin's attendants clean aquarium bottoms with plastic vacuum-cleaner-like dip sticks that are hooked to the filter system for power. Groetzingers' men pump a similar gadget by hand. They suck dirt from the bottom without picking up any gravel. Some air-pump and filter motors come housed in carved teakwood boxes. Pampered finny pets can live in "water conditioned" comfort, where thermostatically controlled heaters keep the temperature hovering at an even 75 degrees day and night. You can even buy modern medication like aureomycin and terramycin specially prepared to cure fish of odd diseases.

Sounds expensive, and it can be if you want to get ultrafancy. C. W. Coates, aquariist for the New York Zoological Society, points out that tank equipment should be picked with great care. It is possible in theory, he says, to keep a healthy, balanced aquarium of tropicals in a bucket or hole in the ground. However, says Doctor Coates, a sensible outfit for any beginner has a minimum of gadgetry. His list includes a good tank, a quarter-inch glass siphon or two for sucking out decaying foods and debris from the tank bottom, a long, quarter-inch dowel for planting in a deep tank, another with a flat, notched end for arranging rocks and plants without disturbing the fish, and fine steel wool to clean green algae from the tank sides. Three nets of various size (to pluck one, a few or all the fish from the tank), a thermometer and two enamel buckets complete the list. With this basic equipment, according to Coates, anyone may start one of the most fascinating hobbies in the world. Where you go from there

AROUND A FIREPLACE

IN THE CORNER



depends on your pocketbook and good sense in choosing useful accessories.

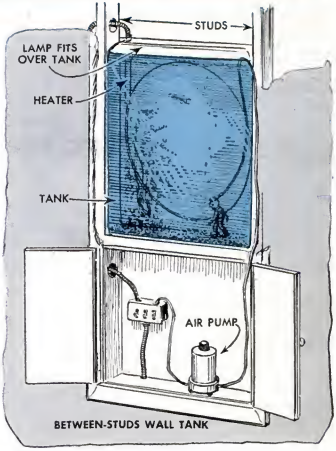
Right now, 12,000,000 amateur aquariists in this country are finding relaxation and fun watching a tankful of tropicals live, love, fight, prepare odd breeding nests and rear their wiggly fry. The unusual pets are noiseless, cost little to maintain and need little attention. They'll survive a two-week stretch without food at vacation time. Put them in a balanced aquarium with plants, sand or gravel, a rock or two for atmosphere, and you have an underwater fantasia right in your living room. The water plants with odd names like hornwort, ludwigia, baby tears, water sprite, color fern, Amazon sword plant, jessica and duckweed not only make an underwater garden for your tank, but oxygenate the water and provide hiding places for baby fish and timid fellows.

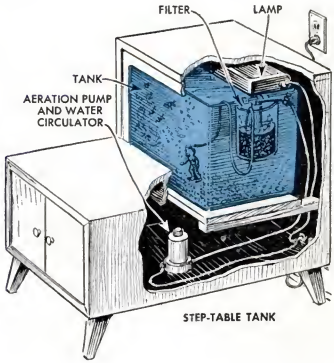
It's impossible to describe all the tropicals available today. Nearly 200 kinds from the rivers of Mexico, South America, India, Siam, Africa and Indo-China find their way into homes. They go under a mighty list of tongue-twisting Latin names. But most can be found under family "handles," like mollienesia (mollies), cichlids, danios, rasboras, gouramis, bettas, panchax, tetras, platys, barbs, swordtails and guppies. They represent all the colors of the rainbow. Guppies are the cheapest, most popular and widely known of the tropicals. They're hardy, easy to keep, brightly colored and range up to an inch long. Experts like Dalwin and the Groetzingers usually recommend them for beginners.

Whether you start with guppies or something more rare and glamorous, you're in for some surprises. Tropical fish are like no other pets on earth. Most are compatible, timid and neighborly. A few are not.

"Some," explains Dalwin, "are antisocial, like bettas. These fierce, vividly colored three-inch fellows with flowing fins are Siamese fighting fish. In Siam (now Thailand), people carry them singly in jars. They are pitted against each other like fighting cocks, and bets are placed on the winner. They tear each other to shreds."

(Continued to page 210)





Seashore well, filled mostly with salt water, also provides fresh water for cattle grazing 15 miles away

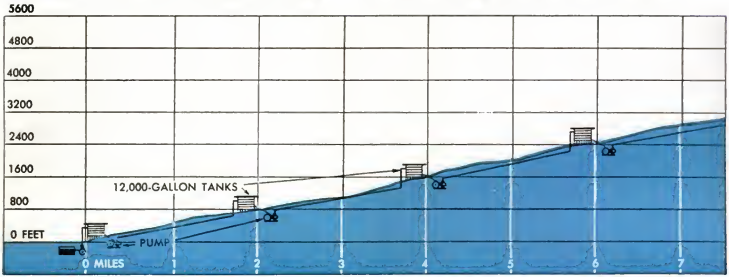
Water Is Pumped a Mile High To Hawaiian Cattle Ranch

By Norman K. Carlson

CATTLE ON the mile-high mountain lands of Kona, Hawaii, have their drinking water delivered direct from seashore wells. It isn't pure water by many a grain of salt, but it is potable to the grass eaters. Nor is it cheap water; the rancher spends 60 cents a month to keep each animal happy. But there is no longer the nagging fear of drought haunting the rancher.

Kona is on the west side of the island of Hawaii. Its long slope is made up of numerous lava flows, the newest one being only five years old. The spewed-out rock stretches from the top of Mauna Loa's 13,680 feet to the sea.

This rather long slope has sharp rainfall



differences. At the shore line and up to 1000 feet it is dry. From 1000 to 2500 feet the coffee grows, well irrigated by 55 to 70 inches of rain. Above the coffee, and in a belt up to two miles wide, 120 inches of rain fall each year. Then above this the rain decreases until at the top of the mountain only 15 inches or so fall each year.

It is from the wet belt that the cattle get most of their water. The rains fall on the very porous ground and quickly disappear through the permeable rocks, trickling down to the ocean in millions of pencillike rivulets, all underground. But there can be dry weather in Kona, even in the wet belt. It can last for two or three months, creating a major problem.

To gain weight or produce calves a cow needs about 10 gallons of water a day. Five hundred head of cattle gulp 150,000 gallons of water a month.

Roofs Collect Water

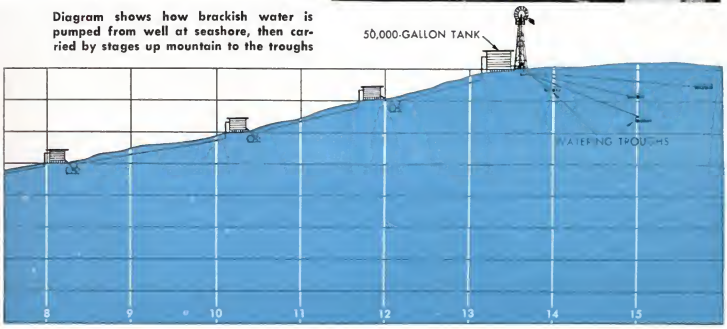
To get this water for the livestock, the ranchers have built roofs of galvanized iron, some small and some an acre or two in area. From these sheds the rain is channeled into 100,000 to 500,000-gallon wooden and steel tanks.

Where it rains 120 inches a year, an acre shed yields 3,250,000 gallons of water. But a 1,000,000-gallon storage tank can cost $50,000 or more. So far, it has not been practical to build reservoirs in the porous lava.

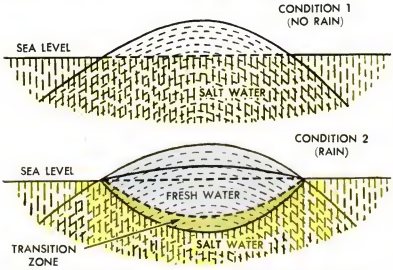
The Horseshoe One Ranch had 12 big tanks flattened by 1950's

Huge metal roofs have been built on the islands to collect rainwater, which then is drained off into redwood storage tanks and saved for future use. Below, engines of the new water system are started by hand. They pump water up the mountainside

Diagram shows how brackish water is pumped from well at seashore, then carried by stages up mountain to the troughs

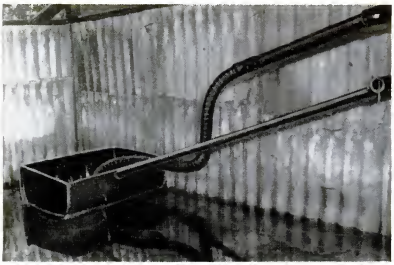


On top of the mountain is a huge storage tank. A windmill pushes the water from the tank to the grazing cattle two miles away



Honolulu Board of Water Supply diagram

After a rain a lens of fresh water appears inside a well of salt water at the seashore. Below, a floating tank supports the intake pipe which draws off the somewhat brackish water



earthquakes. So, instead of replacing the tanks, this outfit built a pumping system.

Workers cased an old Hawaiian well along the seashore and dropped the pump into a lens of fresh water right in the middle of the salt water.

The theory of a fresh-water lens was first announced by two Germans in 1900. It is called the Ghyben-Herzberg principle. Dr. Chester K. Wentworth, a noted geologist in Hawaii, puts the essence of the principle this way: "There is a hydrostatic balance between fresh water and salt water in the permeable rocks of an oceanic island. The fresh water of the main ground-water body floats on sea water with one part above sea level and 40 parts below. There is a continuous recharge of water from the rains that fall on the mountain lands and trickle down through the lava."

The purity of water differs with each well and its location. From the Horseshoe One well at Nawaawaa Bay, the jet pump scoops up water that averages 225 grains of salt to the gallon. A cow can drink water that has 400 to 700 grains of salt. Standards for human consumption are below 25. Sea water averages about 2000 grains of salt.

Pump Skims Surface

The Kealakekua Ranch skims the surface of a large pool of water. A halved 50-gallon barrel floats on the water and holds the suction end of the pump. Depending upon the tide, the water pumped varies from 90 to 130 grains of salt.

At the ocean front, the water from the Horseshoe One well is jetted into a 12,000-gallon redwood tank. From this tank another pump takes over and boosts the water up 800 feet through 1½-inch galvanized pipe. At 800-foot elevation another engine and pump lift the water another 800 feet. And so it goes for 13 miles and 5600 feet above the ocean, seven stages in all. At the end of the system there is a 50,000-gallon tank and close by a windmill; the windjammer pumps the water from the tank and pushes it through ¾-inch pipe for another two miles.

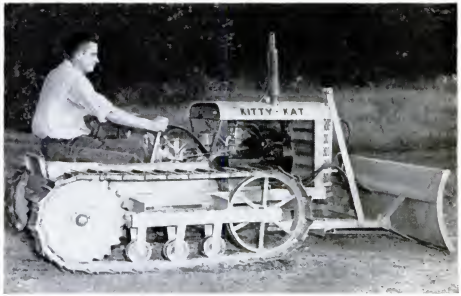
It takes heavy pumps and engines to lift the water load. The

(Continued to page 220)

Crawler Tractor Made at Home

Parts from a 1946 Plymouth furnished the transmission, rear end and clutch of a miniature crawler tractor built by Charles Weber of Elkhart, Ind. Weber built the four-by-eight-foot tractor in one year of his spare time. The machine has a seven-horsepower Wisconsin air-cooled engine equipped with an electric starter. A 20-to-1 gear ratio gives a top speed of five miles per hour. A hydraulic system operates the bulldozer blade. The track for the vehicle was made from flat bar steel.

Tractor mounts full set of controls. Below, hydraulics regulate blade



Test DDT Danger On Humans

To test the dangers of DDT for the U. S. Public Health Service, 14 volunteers ate DDT daily for a full year without harm, some of them consuming every day 200 times the amount an average person would eat in the residue left on fruits and vegetables sprayed with the insect killer.

Experimental Photo Film Made of Flexible Vinyl Plastic

Newest experimental photo film is a thin, flexible sheet of vinyl plastic impregnated with a photosensitive compound. When exposed to a photo negative and ultraviolet light, the film develops a continuous-tone photographic image that extends through from its top to its bottom surfaces. In moderately heavy film, this deep image produces a three-dimensional effect. The depth of the image and the durability of vinyl plastic combine to produce a photograph that will withstand much wear and rough handling. The film may be practical for use in the manufacture of license plates, maps and blueprints, wear-resistant floor tile, forgeryproof identification passes, display signs, and for interior decoration. The film is easier to store safely.

OWNERS REPORT:

POPULAR MECHANICS OWNERS POLL (B-171)

Mark on ☒ in the square after the most accurate answer. Write as many comments as you wish.

1. I own a 1956 Rambler hardtop ☐ sedan ☒ station wagon ☐
   It has standard transmission ☐ overdrive ☐ Hydro-Matic ☒
2. It has been driven 4000 miles to date.
3. It averages 21 miles per gallon in city driving: 25 miles per gallon on long trips.
4. It uses no oil ☒ some oil ☐ considerable oil ☐. How much?
5. Here is what I like best about my Rambler: Very easy to drive and park. Easy ride. Reclining seats are wonderful for long trips
6. Here are my specific complaints: Hose clamps and the shield more carefully - upset.
7. The one feature that did the most to convince me to buy a Rambler
8. I have had no trouble with the engine ☒ some trouble ☐ considerable trouble ☐

BEST-LIKED FEATURE, SAY OWNERS

THEIR MOST-FREQUENT COMPLAINT

6. Here are my specific complaints: Doesn't even come close to the manufacturers claim of 27 miles per gallon but dealer plans to put on a new carburetor
7. The one feature that did the most to convince me to buy a Rambler was: Driving ease
8. I have had no trouble with the engine ☒ some trouble ☐ considerable trouble ☐
   Describe the trouble: None
9. Rambler's over-all performance is Outstanding ☐ Average ☒ Below average ☐. I would like would not like ☒ additional horsepower and acceleration. More top speed? Yes ☐ No ☒
10. The car has power steering ☐ does not have power steering ☒; I rate the way it handles as Outstanding ☒ Average ☐ Below average ☐ Comment: _____
11. I rate the exterior styling Outstanding ☐ Average ☒ Below average ☐. The feature of the exterior styling I like most is None stands out as outstanding. The styling feature I like least is Have no criticism of styling
    Exterior styling did ☐ did not ☒ play an important part in my choice of this Rambler.
12. I rate the interior design Outstanding ☒ Average ☐ Below average ☐. The feature of the interior I like most is the interior - the reclining seats - the heater. The interior feature I like least is None. I have ☐ have not ☒ slept overnight in the car. I do ☒ do not ☐ use the reclining seats. Comment: Bed is not long enough. I like the seats twin-bed arrangement.
13. Here are my suggestions for changes in the Rambler: More realistic gas mileage

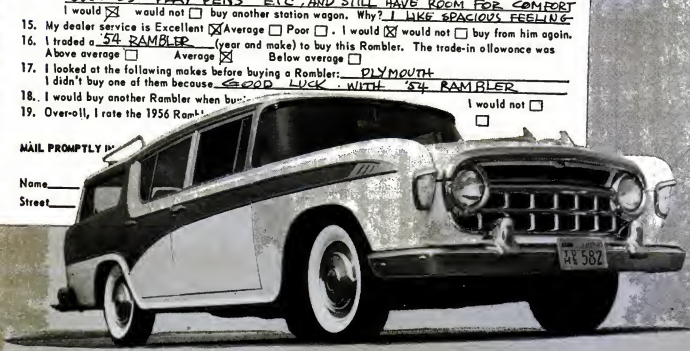
OWNERS WANT DASHBOARD CHANGED

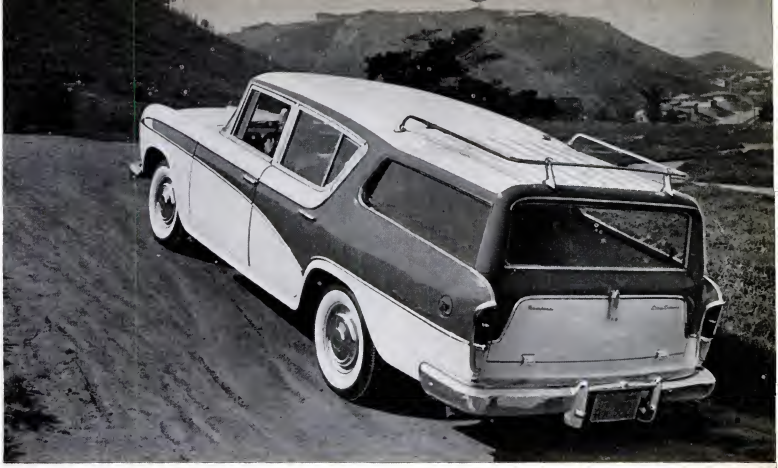
13. Here are my suggestions for changes in the Rambler: CIGARETTE LIGHTER AND CLOCK ARE TOO FAR FROM DRIVER - HYDRAMATIC DIAL DOESN'T LIGHT UP
14. I have ☒ have not ☐ owned a Rambler before. It was ☒ was not ☐ a station wagon.
    The Rambler seems to get bigger every year. I like ☐ don't like ☒ this trend. Why? I LIKE A SMALL CAR
    Station-wagon owners only: Comment, pro and con, on the station wagon as a family car:
    BOUGHT A WAGON BECAUSE OF GROWING FAMILY. WE CARRY BUGGIES PLAY PENS ETC. AND STILL HAVE ROOM FOR COMFORT
    I would ☒ would not ☐ buy another station wagon. Why? I LIKE SPACIOUS FEELING
15. My dealer service is Excellent ☒ Average ☐ Poor ☐. I would ☒ would not ☐ buy from him again.
16. I traded a '54 RAMBLER (year and make) to buy this Rambler. The trade-in allowance was Above average ☐ Average ☒ Below average ☐
17. I looked at the following makes before buying a Rambler: PLYMOUTH
    I didn't buy one of them because GOOD LUCK WITH '54 RAMBLER
18. I would buy another Rambler when buy[illegible] I would not ☐
19. Over-all, I rate the 1956 Rambler [illegible] ☐

MAIL PROMPTLY IN [illegible]

Name_____

Street_____





Rambler Cross Country is a popular family car. It comes with luggage rack on roof. Rear window winds down

Rambler Is Small But Roomy And Easy to Park, Say Owners

As Told By Owners of the Rambler

ARE STATION WAGONS practical? Sales certainly indicate they are. Each year the percentage of station wagons sold goes up sharply—it is the fastest-growing body style there is.

To find out how practical the wagon is, we asked Rambler Cross Country owners about their experiences. Rambler sells a higher percentage of wagons than any other manufacturer—several times higher, in fact.

(Continued to page 109)

CLYMER ROAD TESTS THE 1956 RAMBLER

By Floyd Clymer

HOW DOES a small (by American standards, at least) car perform? To find out, I tested the Rambler station wagon.

The Rambler is stable with little body roll. Due to its short wheelbase (108 inches), it responds quickly to the steering wheel. The suspension system makes for good roadability and the coil springs, front and rear, afford a comfortable ride.

There is some tendency for the rear end to hop around. This is caused by the additional unsprung weight on the rear, the result of the torque-tube drive. The short wheelbase contributes to this tendency also. I have never liked the added unsprung weight of the torque-drive units, but the system does have one excellent

(Continued to page 230)

AN ENGINEER ANALYZES THE 1956 RAMBLER

By Dale Kelly, SAE

Model tested: Super four-door sedan with Hydra-Matic transmission. Rear-axle ratio: 3.58 to 1 (standard for cars with air conditioning). The car tested, however, was not air conditioned; for such cars the usual ratio is 3.31 to 1. This ratio would have given slightly better top speed and fuel economy and possibly slightly poorer acceleration. Curb weight: 3190 pounds with gas tank half full (56 percent of this weight was on the front wheels, 44 percent of this weight was on the rear wheels). Measured wheelbase: 107.5 inches left, 108.75 inches right.

ACCELERATION

TIME IN SECONDS	0-20	0-40	0-60	0-80	¼ mile
Ignition timed for regular or premium gasoline	3.9	9.6	18.5	45	22.2

(Watches started instant accelerator was floored. Engine not run up against brakes before start. Drive 4 range used. Barometer reading was 29.45 inches; temperature was 75 degrees Fahrenheit during tests.)

Top speed: The top speed of this car was about 87 m.p.h.

FUEL ECONOMY

MILES PER GALLON	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Ignition timed for regular or premium gasoline	22.6	19.2	15.0	12.7

ESTIMATED ANNUAL GASOLINE BILL—$153 FOR 10,000 MILES. Based on 2000 miles at 30 m.p.h., 5000 miles at 50 m.p.h., 1500 miles at 70 m.p.h. and 1500 miles in traffic, and on the use of regular gasoline at 27 cents a gallon.

SPEEDOMETER ERROR

MILES PER HOUR							
Indicated speed	20	30	40	50	60	70	80
True speed	19	28	37	46	54	63	72

ODOMETER ERROR

The odometer indicated 5.5 percent more than the actual distance traveled or 105.5 miles for an actual 100.

DRIVER'S VISION

Some portion of the road could be seen 11 feet in front of the car (A in sketch) by an average driver (5 feet 9 inches tall); full width of the road could be seen 18 feet in front of the car (B in sketch).

GROUND CLEARANCE

The end of the tail pipe would drag if the car were driven through a dip whose profile had a radius of curvature of less than 29 feet (solid line in sketch). The muffler would drag if the car were driven over a circular hump with a radius of less than 18.5 feet (dotted line). The oil pan would drag if the car were driven in ruts deeper than 6 inches. The doors would open over a 12.5-inch curb.

MISCELLANEOUS

Octane requirement: The best acceleration from standstill to 45 m.p.h. was obtained with the basic ignition timing set to 5 degrees before dead center; this setting was used for all tests. On an 85-percent octane blend of octane and heptane, equivalent to typical regular gasoline (88 octane Research), the ignition timing could be advanced beyond this point without causing knock, consequently there was no possibility whatever of getting better performance from a higher-octane fuel. This engine has a rated compression ratio of 7.4 to 1, lower than any other 1956 model. The test car had only a 500-mile accumulation of carbon and its octane requirement would undoubtedly increase with increasing mileage. Another car of the same make and model could easily have an octane requirement several points higher or lower.

Steering: From straight ahead, the steering wheel had to be turned 0.8 revolution to complete a circle with an outside radius of 50 feet. Lock to lock, the wheel required 4.75 turns. Turn-circle diameter, curb to curb, was 38.2 feet; from wall-to-wall, 40.4 feet. Steering-wheel diameter: 17 inches.

Center of gravity: The center of gravity of the unloaded car was 24 inches above the ground.

Interior sound level: Inside the car the sound level with all windows closed was 92 decibels at 40 m.p.h., 95 decibels at 60 m.p.h. on a smooth road.

Water resistance: The car was fairly well sealed against water leaks. A few drops got past the doors when the car was washed in a high-pressure car wash; about an ounce got into the trunk in both the car wash and the splash-pan test. In neither test were brakes or ignition affected.

Trunk capacity: In addition to spare tire and tools, the trunk accommodated 12 cardboard cartons of the size used for 48 tall cans of evaporated milk.

Gasoline fill rate: With the tank nearly empty, gasoline spilled out the filler pipe when pumped at more than 10 gallons per minute. Many pumps are capable of pumping gas faster than the pipe will take it.

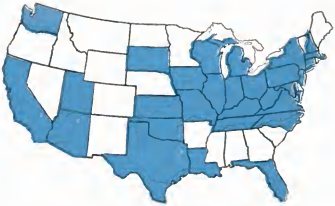
Brakes: In general, the brakes worked well. A woman driver had some difficulty in setting the hand brake tight enough to hold on a 14-percent grade.

Observations: This is one car that does not have a dangerous spearlike ornament projecting from the front of the hood.

A U-shaped steel trap is bolted to each corner of the frame. It is intended for use in tying the car down during shipping, but would also make a very convenient attachment for a tow rope.

The engine is of conservative design and the manufacturer recommends, for normal use, a straight mineral oil (ML grade) about 10 cents a quart cheaper than the MS-DG recommended for many other late models.

Rambler owners in 29 states (in color) from coast to coast tell you about their cars in this report



The Owners Analyze The 1956 Rambler

OVER-ALL RATING OF THE RAMBLER

Excellent	73.4%
Average	23.6%
Poor	3.0%

Had trouble with engine?

No trouble	84.4%
Some trouble	14.2%
Considerable trouble	1.4%

What was engine trouble?

Carburetor	6.3%
Water in gas line	2.8%
Noisy valves	0.9%
Oil leaks	0.9%
Miscellaneous	4.7%

Performance Questions

How is performance?

Outstanding	62.0%
Average	35.4%
Below average	2.6%

Would like more horsepower?

Yes, would	22.4%
No, would not	77.6%

Would like more top speed?

Yes, would	11.1%
No, would not	88.9%

How is over-all handling?

Outstanding	79.8%
Average	19.2%
Below average	1.0%

Styling Questions

How is exterior styling?

Outstanding	65.4%
Average	33.2%
Below average	1.4%

Best-liked style feature?

Large glass area	17.1%
Grille, headlights	16.9%
Colors, three-toning	11.3%
Rollbar	4.8%

Least-liked style feature?

Rollbar paint treatment	13.6%
Headlight arrangement	3.9%
Rear end too high	3.7%
Rear-door shape	3.7%

Did styling influence your choice?

Yes, did influence	52.6%
No, did not influence	43.6%
Undecided	3.8%

Like trend toward larger car?

Yes, do like trend	79.2%
No, do not like it	20.8%

Miscellaneous Questions

Have owned Rambler before?

Yes, have before	40.5%
No, have not	59.5%

Would buy Rambler next time?

Yes, would	60.1%
Might	35.9%
No, would not	4.0%

Would buy station wagon again?

Would buy another wagon	94.9%
Would not	5.1%

(Asked of wagon owners only)

How is dealer service?

Excellent	57.0%
Average	28.6%
Poor	14.4%

Would buy from him again?

Yes, would	81.5%
No, would not	18.5%

What make car was traded?

Traded Rambler	33.4%
Other American Motors	28.7%
Non-American Motors	31.2%
No trade, no answer	6.7%

Best-Liked Features

Handling ease	59.1%
Ride, comfort, seats	46.3%
Economy of operation	39.0%
Exterior styling	29.4%
Easy to park	15.8%
Roominess	15.0%
Driver vision	14.4%
Performance	13.4%

Most-Frequent Complaints

No complaints at all	31.3%
Uses too much gasoline	15.5%
Dashboard design	14.4%
Poor assembly work	8.2%
Water leaks	8.2%
Hydro-Matic operation	6.8%
Radio poor	5.4%
Poor paint job	4.1%
Rattles	4.1%

Why Did They Buy Rambler?

Advertised economy	35.1%
Exterior styling	16.1%
Previous ownership	9.8%
Small exterior size	5.7%
Price	4.1%

The result? Owners like the wagon. Of those who now own a station wagon, 94.9 percent will buy another wagon when they buy a new car. Most of the 5.1 percent who said they wouldn't have some special reason that does not involve the wagon itself (for example, the family will have grown or will no longer be living in the country).

Here are some quotations from owners of station wagons:

"To date, it has been ideal. Problems of other cars, such as where does the playpen go, the dog and other necessities, have been eliminated."—Illinois general manager.

"How can you beat it? I use it in my car pool to haul six adults to work, then on week ends haul 4-by-8 sheets of plywood. On long trips, it's a mobile playground for the baby."—Illinois sales engineer.

"It makes a safe place for the children to ride. They cannot open the windows and fall out."—Oklahoma utility worker.

"We buy trunks in other cars but seldom use them. Rear of wagon is more convenient."—Ohio machinist.

"Not being a family man I bought the wagon for fishing and hunting trips. Just the thing for that."—Michigan airline agent.

"Station wagon is the answer to a fisherman's dream. Room for four persons to sleep."—Utah locomotive engineer.

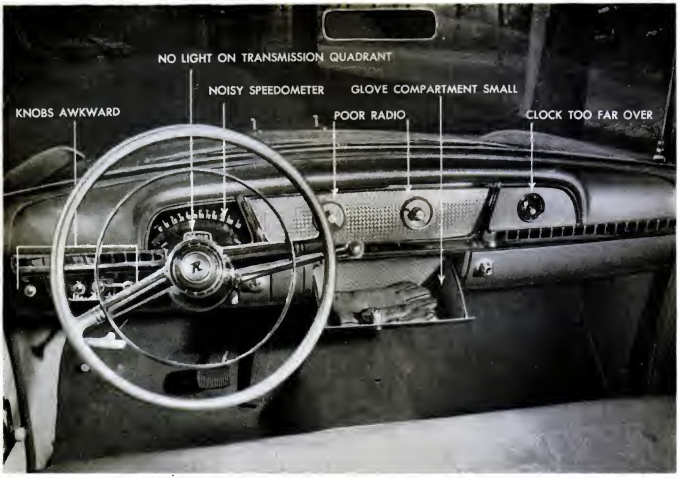
"We have two cars and the station wagon is easily the one in most demand."—Wisconsin executive.

"Before we bought this Rambler we tried all makes. The Rambler is the one wagon comfortable on long trips."—Ohio engineer.

But there are some who have complaints, even about the wagon:

"Good except for the rear-seat clamps. When the seat is folded down, the clamps are dangerous for children playing in rear."—Ohio student.

"Height from ceiling to floor at rear of



Principal area of complaint by owners is the dashboard. Labels on this photograph point out what they say

wagon should be increased." — Michigan dry cleaner.

"Should pipe heat into rear of station wagons."—Indiana painter.

"Would like more space in spare-tire compartment."—Illinois cabinetmaker.

"I don't like station wagons. I always smell exhaust fumes in one and I carry tools and don't like noise they make. I don't own one now."—Tennessee plumber.

Best-Liked Features

That should have convinced you about station wagons. Now what about the Rambler over-all? The feature Rambler owners like the most is its fine handling ability,

Spare tire is carried under floor of station wagon. There is no upper half of rear door to bang head on

Owners report the six knobs for heater, lights and wiper are awkward and clumsy. Some pull off easily

59.1 percent listing it. Second on the best-liked list is riding comfort and the reclining-seat feature (46.3 percent). Third is economy of operation (39.0 percent).

"We have driven this car over 600 miles a day on several occasions and find it does not leave us all tired out. Seems to have good road balance." — South Dakota driller.

"Ease of handling makes driving in heavy traffic much more pleasant than in any other car I've driven."—Kentucky reporter.

"This Rambler was bought for my wife. It is more pleasure to drive in traffic than my other car that costs plenty more. Now I use the Rambler for the business and she uses the other car. May have to buy her another Rambler to keep her happy." — California businessman.

"We have two other cars (both big cars), but since getting the Rambler find ourselves using it for everything, leaving the other two cars in the garage. Can't praise the Rambler enough. It's an exceptionally fine woman's car." — New Jersey housewife.

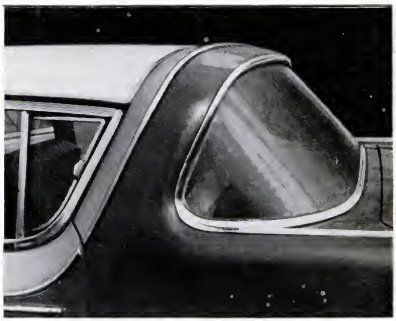
"I recommend this car to anyone who, like myself, has found driving has become a drudgery. I can say with emphasis, I enjoy motoring once again."—New Jersey businessman.

Riding comfort is the second best-liked feature:

"This is my 35th car and the first small car since back in the '20s. I was apprehensive about comfort at first since I travel a lot, but my 1800-mile trip was agreeably surprising."—Virginia salesman.

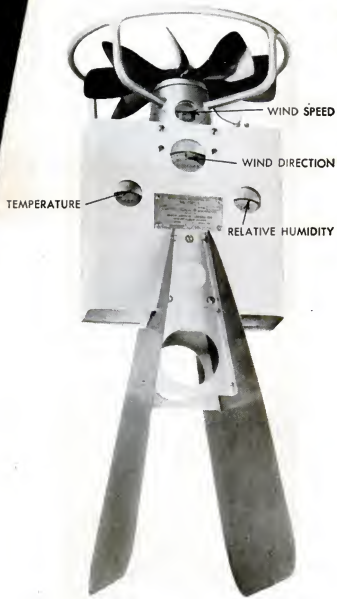
(Continued to page 224)

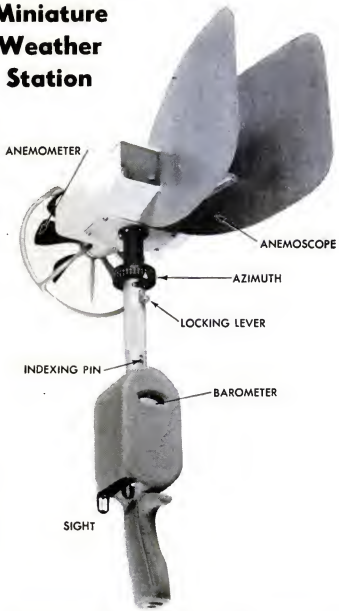
If you want room, you get plenty of it in the Rambler Cross Country. Its interior is much wider than in previous models. Here the wagon is shown with its rear seat folded into floor



Above, some owners dislike the bold rollbar styling over the rear window. Others praise it as a safety factor. Below, the new and distinctive sedan styling has a refreshing tautness

Miniature Weather Station





Weather readings at sea in darkness or during rough weather will no longer be difficult, now that a miniature weather station has been developed for the Navy. When held at arm's length for a few moments, the sensing elements of the set measure surface atmospheric pressure, temperature, relative humidity, wind speed and direction. A lever locks all readings in place for subsequent noting and recording in a sheltered area. The weather set was designed primarily to supplement standard permanent weather instruments under conditions which make it impracticable.

Parking-Fine Collector

Parking fines are paid into a small metal unit that takes the violator's ticket number and issues a receipt. The special ticket placed on the violator's car by a policeman is inserted in the unit. Coins in the amount of the fine—25 cents or more—are placed in the device and a crank is turned. Part of the ticket bearing the serial number is cut off and kept in the collection box. The receipt stub retained by the motorist is marked "paid."

◐[Age of the universe is 5,400,000,000 years, give or take a billion, according to a committee report on a 20-year study made by astronomers from Lick, Palomar and Mount Wilson observatories.

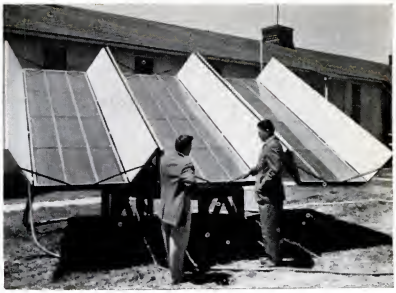
Sunlight Replaces Wind For Pumping Water

Solar pumps may take the place of windmills in areas where sunlight is plentiful and the wind doesn't blow every day. One solar pump, developed in Italy and now being tested by Stanford Research Institute, develops from 1 to 1½ horsepower.

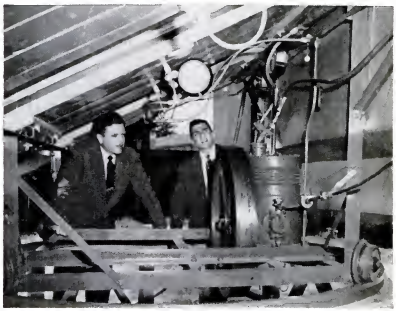
The pump consists of three black panels with side reflectors that transmit solar heat to pipe coils containing liquid sulphur dioxide. The heat converts this liquid into steam and the steam operates a one-cylinder pumping engine, after which it is reduced to liquid again in a water-cooled condenser and is recycled to the heating coils.

Also being considered for further research by the institute is a means of obtaining water from the air to help alleviate California's growing water shortage. Preliminary testing has been done on a simple sheet of metal painted black and reinforced underneath by fiber-board insulation.

Moisture-laden air, at a temperature of about 60 degrees, passes over the metal, which has a temperature of 40 to 50 degrees. The resulting condensation produces tiny droplets of water which roll into a bucket placed at the base. The system is effective only at night, during seasons when moisture and temperature permit condensation.



Heating surface of solar pump has 120 square feet, plus side reflectors to concentrate heat. The one-cylinder engine below the panels is run by steam from sulphur dioxide raised to the boiling point by the solar panels. It develops one horsepower



German Motorcycle Has Push-Button Shift

Motorcyclists who ride a new German motor bike shift gears electrically with a push-button shift control. The keyboard, or control panel, is mounted on the left handle bar. There are four buttons on the panel, the transmission having four speeds forward (no reverse gear is provided on motorcycles, of course). According to the manufacturer, this is the first time a push-button shift has been incorporated in a two-wheeled vehicle. Being electric, the shifting is done instantly when the button is pushed.

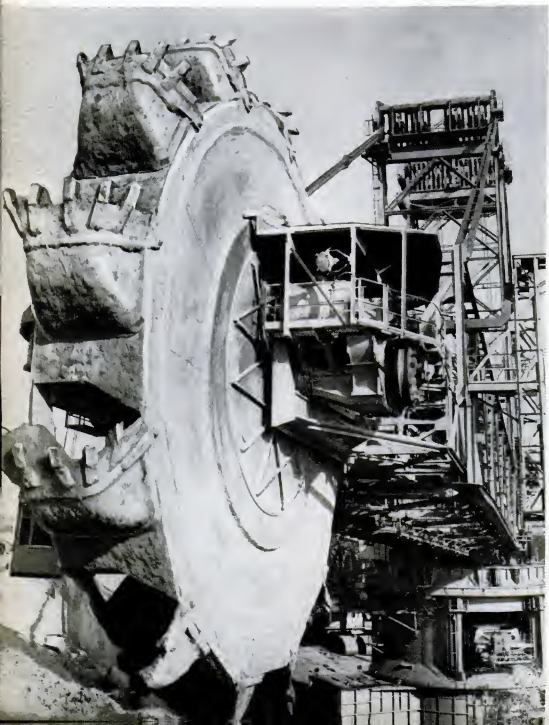
¶Average life of a television picture tube is about four years.

Earth-Eating Monster 656 Feet Long

MORE AWESOME and powerful than any of the dragons of mythology, a giant dredger scoops lignite from a huge pit near Cologne, Germany. A wheel 52 feet in diameter rotates at the end of a long boom to scoop up the material in buckets and deposit it on a conveyor belt. The belt carries the lignite to the center of the machine and dumps it in railroad cars parked below. Shortwave radio signals from the dredger control the movement of the rail cars.

The 5500-ton machine, 656 feet long, has 18 crawler units for feet. One of the 116 electric motors on the dredger powers the huge digging wheel as its 12 teethed buckets scoop up the mineral.

The mining machine, built by two German firms, cost $5,000,000 and is said to be the largest of its kind in the world. Two more are under construction.



Teeth on buckets of the dredger's digging wheel chew out huge bites. The wheel has 52-foot diameter

Giant dredger moves on 18 crawler units. Conveyor belt carries lignite to railroad cars underneath the machine

Controller of the machine's appetite is operator in a cabin mounted near the wheel. He controls the speed and depth of the bite with levers and switches

Dredger's wheel dwarfs a bulldozer in the huge pit it has eaten out. Two more dredgers of the same giant proportions are under construction by German firms

One arm held directly over the head is the signal for immediate help and should not be used except as an emergency signal either above or below the surface

Left, "Surface at once!" is indicated by raising arm with pointed finger and moving the arm up and down. Skin diver is wearing rubber diving suit

Right, danger signal is given by holding finger or extended hand across the throat. Gear includes knife and lead weights around diver's body

SKIN-DIVER TALK

By Thomas E. Stimson, Jr.

GOOD COMMUNICATION—especially in a time of emergency—is recognized as an important safety aid in any type of endeavor. In order that skin divers may communicate with each other under water or on the surface, the California Council of Diving Clubs has adopted a new safety signaling system. The club hopes that it may develop into an international language for skin divers.

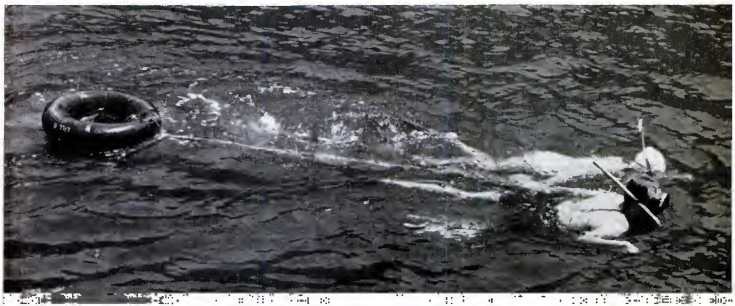
The hand signals advocated by the club are based on natural actions that help convey the meanings of various motions. Bob Retherford, safety chairman of the Sea Sabres Club of Downey, Calif., worked out the system. He believes the signals may help reduce fatal accidents among skin divers who follow approved safety rules ("Skin Divers Play It Safe," *Popular Mechanics*, June 1955). All signals in Retherford's system are performed by one hand alone. The system may be used by every diver regardless of whether he wears a simple faceplate or a complete artificial-lung unit. Most of the signals in the system are shown in the illustrations on these pages.

One of the signals not shown here consists of four short blasts of a boat horn or one mounted along the shore. This signal means: "Get out of the water immediately!" The four blasts indicate an emergency condition, such as the presence of a large shark in the immediate area. Two long blasts of the horn are a recall signal to bring divers in to discuss a change of plans.

Another important signal is given by slapping

Right, holding finger to ear means "Ears not clearing properly." Diver is wearing depth gauge strapped to right arm

One of skin diver partners tows an inner tube used as a float. Gunny sack tied to the tube will hold fish



CRAMPS
FIST CLENCHED AND UNCLENCHED AND POINT TO AREA AFFECTED

NO!
FOREFINGER WAVED SIDE TO SIDE

LEAKAGE IN DRY SUIT
CRISSCROSS MOTION ACROSS STOMACH OR AREA OF LEAK

WAIT!
FLAT OF HAND TOWARD PARTNER

FATIGUE
PALM UP IS RAISED AND LOWERED

NAUSEA
HAND PLACED OVER MOUTH AND WITHDRAWN

COLD
FIST CLENCHED AND ARM EXTENDED AND RETRACTED SEVERAL TIMES

COME HERE!
WAVING IN WITH PALM OF HAND

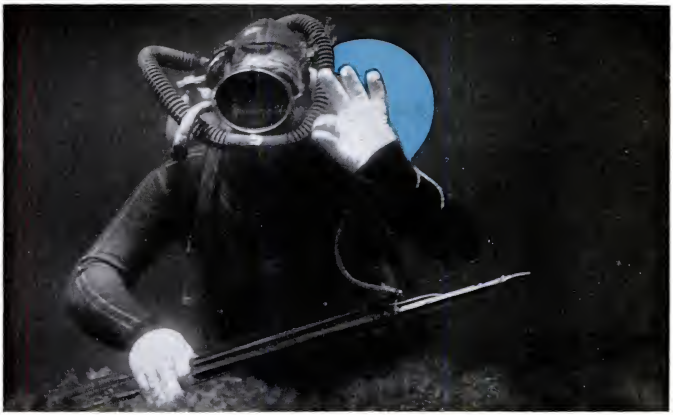
LOOK BEHIND YOU
HITCHHIKER'S SIGNAL

YOU'RE GOING TOO DEEP — NO FARTHER FOR ME
POINTING DOWN WITH FINGER AND USING "NO" SIGNAL

LOST BUDDY
STRIKE SURFACE WITH CUPPED PALM. BUDDY SHOULD HEAR AND SURFACE. SOUND GOES 70 FEET

LOBSTER OR CRAB
WIGGLING FINGERS

FISH
WIGGLE PALM OF HAND IN DIRECTION OF FISH



This is the signal for "Okay" or "I agree." Tips of thumb and forefinger touch, other fingers extended

the surface of the water with a hand. This makes an explosive sound that can be heard as far as 70 feet below. A diver can use this signal when he has ascended and cannot find his diving partner. The partner should surface at once when he hears the signal.

Some hand signals describe types of quarry, such as a V sign to indicate the presence of a shark or wriggling the fingers to indicate lobsters. The basic safety signals have been recommended for national adoption. Quarry signals may be changed to fit local conditions. ★ ★ ★

"I need air! Give me your mouthpiece." This signal is given by pointing at mouthpiece of diving lung

Members of many skin-diver clubs have adopted the V signal to indicate the presence of a menacing shark

Fourteen large ships and over 100 small ones have been lost or damaged on Ripple Rock or in its whirlpools

Blast to End Sailors' Peril at Ripple Rock

RIPPLE ROCK, the terror of ship captains who use the Inside Passage to Alaska, is going to get its head blown off.

The menace to navigation is located in Seymour Narrows between Vancouver Island and the mainland, about 100 miles north of Vancouver. Nearly all coastwise shipping uses the channel, which is a half mile wide and 325 to 400 feet deep. The obstruction consists of twin underwater peaks that rise to within 9 and 20 feet of the surface at low water, near the middle of the channel.

Not only is Ripple Rock a hazard in itself, it produces vast turbulence and giant whirlpools in the 10 and 15-knot tidal currents that race through Seymour Narrows. Small craft have capsized in the whirlpools and large ships are pulled off their courses.

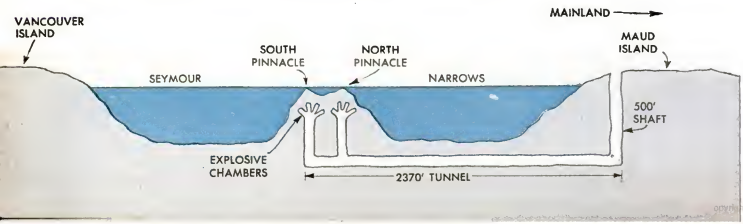
The condition is so dangerous that most ships wait for slack tide at each end of the strait like cars on Main Street waiting for a green light. Then they have 20 to 40 minutes to make their way through the two-mile-long Narrows and past the rock. Even so, strong winds can still drive a ship perilously close to the submerged peaks.

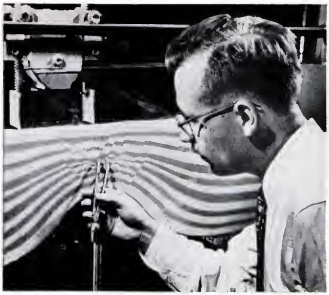
It is estimated that since 1875 some 14 large ships have been lost or damaged on Ripple Rock, in addition to well over 100 smaller craft, with a loss of 114 lives. Delays by vessels waiting for slack water in the Narrows have been estimated as amounting to millions of hours per year.

Engineers have tried to blast the tops off the pinnacles without success. In one case the fast currents snapped the anchor cables holding the drilling barge almost as fast as they could be replaced. In another attempt it was found impossible to drill shot holes because of the pitching and swaying of the barge in the turbulent water.

In an all-out attack to end the menace once and for all the Canadian Department of Public Works is financing a new idea. A 500-foot shaft is to be sunk on an adjoining island and a 2370-foot tunnel will be run under the channel to a point beneath Ripple Rock. The miners will then drill upward from two locations and will excavate numerous small chambers under each of the two pinnacles. The spaces will be packed with a total of 750 tons of high explosive. The resulting blast is expected to blow off the top 75 feet of each peak.

Two construction firms have united to perform the $2,639,000 job. The big blast, and the final taming of Seymour Narrows, are scheduled to take place in late 1957 or early 1958.





Machine Re-Creates History To Aid Prospecting for Oil

Geologists of the Gulf Oil Corporation, trying to learn more about where the earth has hidden its oil, have built a machine which re-creates the passage of 200,000,000 years in the earth's crust. A hopper deposits clay in a glass case to simulate sand and rock strata. Then a mechanical salt dome bears against the bottom of these formations, just as it happened under the earth's surface. A salt dome is salt deposited by an ancient sea which is forced upward by the pressure of heavier rocks around it. The salt-dome action causes the model's strata of clays to fracture, creating structural traps. Such traps may catch and hold oil, and so are a major goal of oil prospectors. Already the model has shown faults at an unsuspected distance from the dome that caused them, giving new clues about where to search for oil.

Folding Clothes Drier Has No Moving Parts

Warm air currents, induced by heating elements in the side of a fold-out cabinet, dry laundry without the use of moving parts. A load from a small washing machine can be placed on the nine rails of the compact drier, which folds to a size of 18 by 36 by 3¾ inches for carrying. The three sides of the extended unit are made of plastic sheeting. The unit, made in England, shuts off automatically when folded. A red light indicates that it is turned on.

German Snack Boat Brings Refreshments Right to Boaters

Midstream delivery service for swimmers and boaters is the specialty of this floating snack bar in West Berlin's Havel River. A boatowner with an eye for business sails up and down the river selling food, coffee, cigarettes and other items that people on an outing might want. To get what they crave, the sport fans need do no more than hail the passing snack boat, and they get immediate delivery.

WHAT'S NEW FOR Your Home

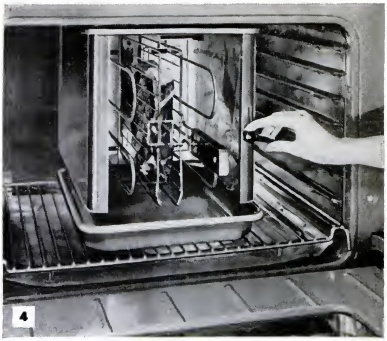
1. WATER-PRESSURE SYSTEM is enclosed in a gleaming kitchen cabinet. A jet pump driven by an electric motor mounted on the 12-gallon tank delivers up to 760 gallons of water per hour. The unit acts as the sole pump to draw water directly from a 25 to 80-foot well. Gauge, switches mount on control panel
Clayton Mark Co., 1900 Dempster St., Evanston, Ill.

2. PORTABLE MIXER also serves as knife sharpener. Sharpener, concealed by a snap-in cover, is ready for use as soon as mixing blades are removed. Steel guides hold the blade at correct angle for honing. Mixer has three speeds, chrome-steel blades
Steam-O-Matic Corp., 6618 E. 37th St., Kansas City 41, Mo.

3. MOWER that combines the features of rotary and reel types has multiple overlapping blades that revolve at 5000 revolutions per minute. Each stem is cut by impact from the top down. Grass is chopped into a fine mulch. Cover stops flying sticks, stones
Henderson Mfg. Co., Fisher, Ill.

4. VERTICAL BROILER for electric ranges cooks both sides of meat at same time. Searing action like charcoal broiler seals in juices and preserves flavor. Grease drains off quickly into lower pan, practically eliminating smoke. Distance between heating elements and meat rack is controlled by turn of a knob. Broiler fits old and new models of maker's range line

Gibson Refrigerator Co., Greenville, Mich.



4

5. FOLDING PICNIC TABLE made from kit collapses in minutes for storage. Lumber is furnished by customer. Wrought-iron legs and supports are attached to a table top of any desired length from four to eight feet. When the legs are unfolded, seat boards hook into place. The legs are "ski type" that will slide across the lawn easily when table is moved during mowing

Belson Mfg. Co., East River Rd., North Aurora, Ill.

5

6. UTILITY STOOL has steps on all four sides. Circular bracings for the legs are actually the steps on which the user climbs. Eight nonskid treads insure safe stepping while flaring legs provide wide, sturdy base. Rubber-tipped feet don't mark floors. The stool can also be used as an accessory furniture piece on porches and patios to hold flowerpots or magazines

Trembco Products Div., 1517 St. Clair Ave., Cleveland 14, Ohio

7. INTERCOM for homes ends necessity of opening door to talk to strangers. The electronic unit is designed for two-way communication between any central point in the house and both front and rear doors. Its warm-up time is two seconds, according to the manufacturer. Weatherproof outside unit is built into exterior wall. Master unit is either built-in or surface-mounted

Republic Electronic Industries Corp., 31 W. 27th St., New York City

6

7

Meter Figures Phone Charges

Cost of long-distance calls can be computed on a meter built into this West German telephone. The meter is installed just below the dial. Meters made their appearance along with West German long-distance dialing.

Road Map in Compact Holder Shows One Section at a Time

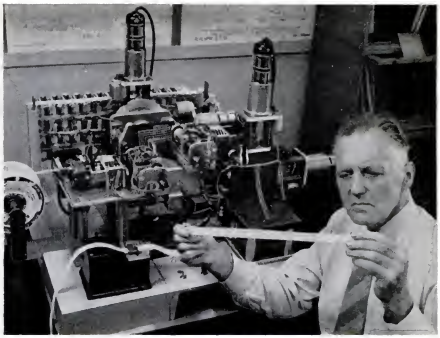
Fighting a cumbersome road map isn't necessary when you have a map contained in a small frame. Pressing side levers brings different sections of the country into view. You can outline your route with crayon on the map's transparent cover.

Rain Meter Triggers Alarm to Awaken Municipal Pump Operator

Rainfall triggers a homemade alarm built by Walter Gibler of Council Bluffs, Iowa. Gibler, pump operator at the municipal sewage lift station, must be awakened at night when rain threatens to overload automatic operation of the lift station. Heart of the device is an old float switch salvaged from a discarded automatic pump. Gibler has placed the float bulb in a pan under a house-roof downspout. When runoff accumulates to six inches in the pan, the float bulb trips the switch and rings a doorbell in the Gibler bedroom. The six-inch water depth means a general rain of at least ¼ inch, sufficient to require auxiliary pumping at the lift station, which raises all runoff and sanitary sewage 7.8 feet to provide a gravity flow to outlets in the Missouri River.

Feed Detergent to Turkeys

Detergent added to the feed of turkeys enables them to digest whole grain more easily, a study has found. When a trace of the washing compound was added to the feed of 235 birds, they gained more weight on less feed. No toxic effects were noted.



All electrical connections for radio receiver are made by automatic machine, which follows punched tape

Automatic Wiring Machine

Complex electrical apparatus is wired by a machine that follows directions indicated on punched tape. The experimental machine, developed at Bell Telephone Laboratories, uses two spindles to make solderless connections. One spindle draws wire from a large spool to a connecting terminal. A second spindle cuts the wire to the correct length. The spindles remove insulation from each end of the wire as they whip the bare wire ends around the rectangular terminals. The process is then repeated at the next terminal. The machine can be used with similar plastic panels on which are different tubes, resistors and other electrical components.

Hangers Grip Ceiling Beams to Support Maintenance Scaffolds

Scaffolds for painting and other maintenance work can be hung from ceiling beams with a new kind of support. The unit hooks around the lower flange of a steel beam with a tonglike clamp and has a 14-inch stirrup to hold planks or metal catwalks. Provision is made for bracing and guard rails. The length of a unit is adjusted from 6 to 11 feet with a pin inserted through the telescoping steel tubing. The hangers are most valuable where machinery or other obstructions rule out standard scaffolds.

Hanger clamps flange in viselike grip. Pin holds adjusted position. Series of hangers support catwalks

What's New in Boating

ALL OVER the land, boat lovers, who have been going around all winter with that faraway gleam in the eye, have popped to life. For the past two months, since the boat shows closed, you could hardly hear yourself think, for the sound of hulls being scraped and varnish being swished on. And now, with "*Little Lulu III*" all gleaming and shipshape, Mr. Boat Lover is out on the water churning a wake.

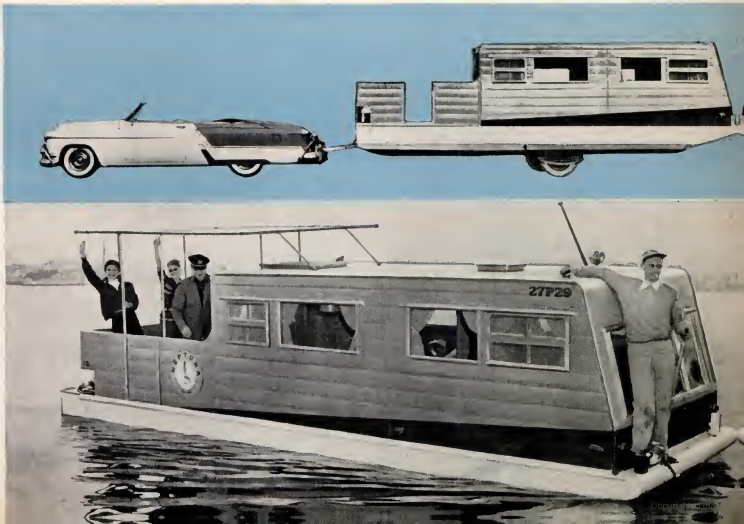
Boating is rapidly becoming the largest outdoor sport in the nation, and a lot of new items have been added to it since Mr. B. L. put *Lulu* away last fall—things that will add to his enjoyment. And there are some unusual boats just out which might tempt him, too. On these pages we present a quick roundup of the newer boats and accessories to bring Mr. B. L. up-to-date. ★ ★ ★

Racing at the top of the opposite page are two self-propelled, unsinkable aquaplanes. With an outboard motor in bow, each glass-fiber boat weighs 155 lbs.
Luria-Cournand, Inc., Havre de Grace, Md.

Above, for ski-minded fans, a single-cockpit boat with storage facilities for skis, gas tanks and gear under aft deck — and towing eyes on transom
Feather Craft Inc., 450 Bishop St., NW, Atlanta, Ga.

Skier at bottom of opposite page soon will be skimming over the water behind a new 33-horsepower motor with a unique tow ring that makes steering easier
Scott-Atwater Mfg. Co., 2001 E. Hennepin Ave., Minneapolis, Minn.

Below, a houseboat that's at home in water and on the road. Sleeping four, it's 26 feet long and 8 feet in beam, with wheels that retract into the hull
Neptuna Corp., 723 Sonora St., Glendale, Calif.



Houseboating goes as modern as tomorrow's ranch home in this twin-hulled 44-foot job. Powered by two 100-horsepower engines, it has everything including hot and cold running water. Even air conditioning is available. Interior has bathroom with shower, a modern galley, stateroom and lounge

Falls City Flying Service, Inc., Bowman Field, Louisville, Ky.

Biggest sailboat ever made with a glass-fiber-reinforced hull is the 42-foot auxiliary ketch, *Arpege*. Thin shell of mahogany veneer placed over forms shaped the boat and was covered with 19 layers of plastic-impregnated glass-fiber cloth. The 16-ton boat was built for scientific expedition in the Pacific

Luria-Cournand, Inc., Havre de Grace, Md.

Completely transparent 8-foot plastic pram brought out as a tender for larger boats can be rowed easily or powered by an outboard motor up to three horsepower. Handles easily to make it an excellent boat in which youngsters can learn

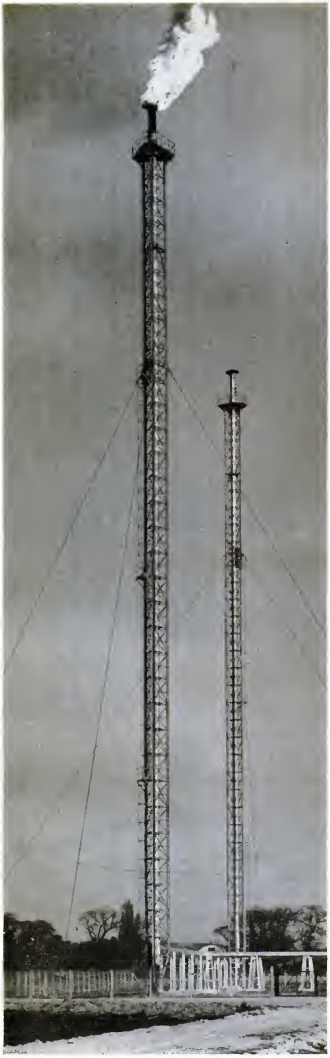
Sudbury Laboratories,
South Sudbury, Mass.

Even the old life preserver has been modernized. This one, 20 inches in diameter, is of molded plastic foam which will not absorb water, covered with glass-fiber cloth and plastic. Built right in are flare guns, a dye marker and lines for lashing

Surface Coating Engineers,
211 Woodward Ave.,
Kalamazoo, Mich.

For the boating enthusiast who wants the convenience of remote steering by wheel, there is a kit which employs automotive steering principles and eliminates tiller ropes. Aimed at the outboard owner, kit is adaptable to all craft regardless of size

Gemmer Mfg. Co.,
6400 St. Elliot St.,
Detroit 11, Mich.



Workman inserts two-inch-thick steel ball into the base plate. Ball acts as rocker bearing between the recessed plates of the mast base and the foundation

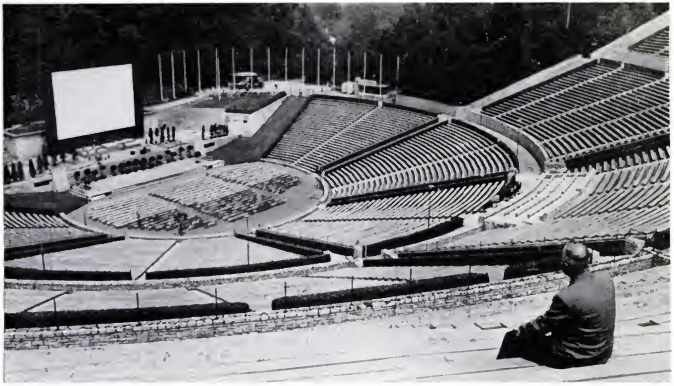
Tower Balanced on a Ball

Rigid, 250-foot-tower stacks erected on marshy ground in Wales are each balanced on a steel ball only two inches in diameter. The ball, set between the recessed plates of mast base and foundation, acts as a rocker bearing. Three guy wires keep the 21-ton structure upright, but allow it to sway up to 2½ feet from a vertical position in a 75-mile-per-hour wind. Waste gases from an oil refinery flow up the stacks and are burned as they exit.

Plant Breeding Speeded

Disease-resistant plant strains can be developed in a hurry by using a method perfected at Louisiana State University. A poisonous toxin that acts like the disease itself is used to inoculate the seed. The few seedlings that are not knocked out by the inoculation form the basis for a disease-resistant strain. The method, first used with oats, shortens development time from 15 years to one year. Under old methods, wild varieties had to be crossed and recrossed to develop an entirely new variety that might be resistant to a disease.

¶By turning a key on the dashboard, the owner of a Cadillac can automatically close and lock the trunk by remote control.



Open-Air Movie Theater in Berlin Seats 25,000 Spectators

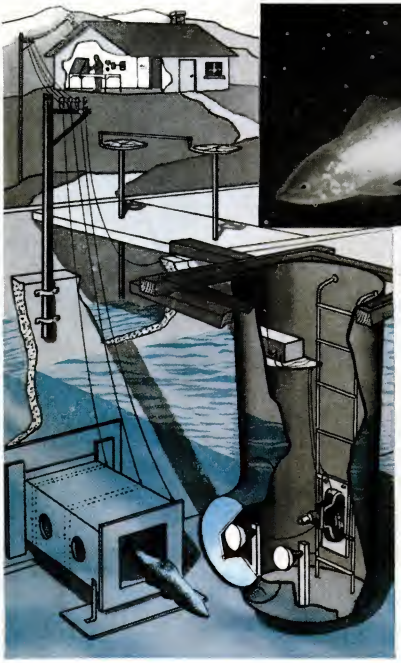
One of the largest movie theaters in the world is the *Waldbühn*, an open-air amphitheater in Berlin that seats 25,000. It was the site of the Berlin Film Festival. The powerful projector used must be cooled by compressed air. The cinema screen is made of linen. This year, it is expected, the theater will be equipped with Cinemascope.

Improved X-Ray Tube Takes High-Speed Pictures

X-ray pictures at speeds up to $\frac{1}{1000}$ second are now possible using an ultrashort-exposure tube developed at the University of Oregon Medical School under the direction of Dr. Charles T. Dotter. The maximum speed previously possible was $\frac{1}{120}$ second. Because of the high speed of the tube, specific information about the rapid and involuntary movements of the heart can now be obtained, and it will be of help in heart-surgery cases. The detail in the ultrashort-exposure films is superior to the slower, older types and all blurring is eliminated.

Dog Seat for Cars

Fido can now ride in comfort when you take him on automobile trips, sitting in his foam-rubber padded seat. The seat is actually an open-top metal crate intended for use on the car's front seat. Measuring 8 by 14 by 18 inches, it folds for storage and can be adjusted for height. The seat is held in place by two long handles which attach to the back of the car seat.

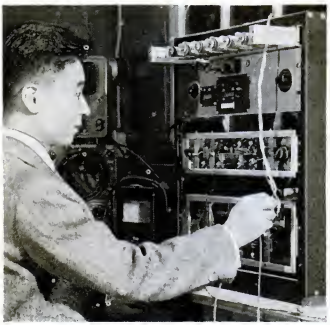


Fish Snap Candid Photos While Swimming Locks

FISH ARE SNAPPING photographs of themselves at Ballard Locks near Seattle, Wash. A concrete and steel cylinder has been installed in the locks with the top barely clearing the water. Near the bottom of the cylinder is a window, and inside is a 16-mm. camera and lighting equipment. Fish swim through a boxlike arrangement in the locks. Having greater electrical conductivity than water, they trigger an "electronic bridge," causing the camera to snap a photo. About 2000 fish can be photographed on a single 50-foot roll of film. The equipment is set up to photograph only the large fish, not the many small fry. A passing fish also flashes a count of itself to a laboratory nearby. The equipment gives scientists a record of the numbers, size, species and sex of fish in the Pacific Coast area.

As fish passes through opening, it triggers camera and lights. Above right is a photograph taken by the camera. Below, fish also flashes signal to this counting equipment in the laboratory. Below right, tank is swung into position in locks

U.S. Fish and Wildlife Service photos



Revolving Work Platform Tops Railroad Car

Trouble shooters fixing trolley lines on the German Federal Railway stand on a revolving bridge that's mounted on a diesel-electric car. The bridge can be turned, lowered or raised hydraulically. The men get their instructions via walkie-talkies. Twenty of the cars, furnished with tools and able to travel even when power lines are dead, will be put into service in the Ruhr district.

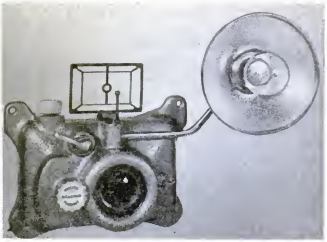
Silence Jet's Roar With Large Sieve

Jet aircraft may be quieted in the near future by a sievelike silencer which can be turned on or off by the pilot at will. The silencer changes the low roar to a high-pitched hiss, and much of the sound is transferred beyond the range of human hearing. The pitch of the sound is raised by forcing the gases through many tiny holes instead of one large opening. The device is designed to be used when landing, taking off and idling, and to be turned off in high flight. During flight, the silencer is stowed like a collapsible drinking cup.

International Airstrip Straddles Border

Straddling the United States-Canadian border at a point 18 miles north of Scobey, Mont., is the only airfield in the world that crosses an international boundary. It is a landing strip 120 feet wide, dedicated in June of 1955 and built to serve the residents of the area, flying farmers and ranchers who find the airplane an important means of transportation. Customs stations for both the United States and Canada are located on the strip. Funds for its construction were furnished by the Montana Pilots Association, the county and the state aeronautics commission.

¶Contaminated water can be sterilized economically by exposure to ultraviolet radiation from powerful bactericidal lamps, according to Dr. Rudolph Nagy of Westinghouse Lamp Division Research Department.



Watertight flash unit on underwater camera case permits taking color pictures far below the sea

Underwater Camera Case

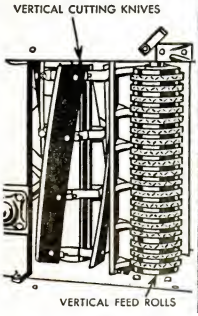
Skin-diving photographers can enclose a Leica or similar 35-millimeter camera in a watertight case that protects it at a depth of 200 feet. Full external control is provided, and the watertight flash unit permits taking color pictures. The case is made in England.

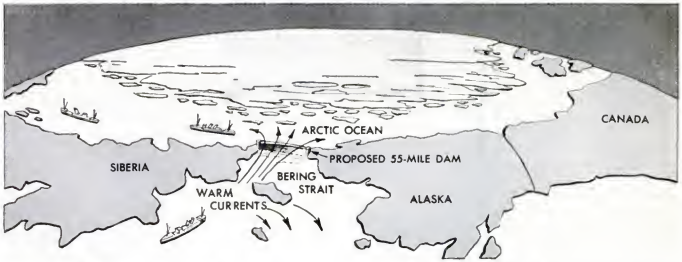
Physicists Create Rare Minerals With Heat and Pressure

Rare minerals have been created at U.C.L.A.'s Institute of Geophysics by duplicating conditions that form minerals deep in the earth's crust. Temperatures as high as 1800 degrees Fahrenheit combined with pressures up to 1,200,000 pounds per square inch do the job. Jade has been created from feldspar, aragonite from limestone and various dense aluminous minerals from ordinary clay. Coesite, a dense mineral occuring 40 miles or more below the earth's crust, was made from common quartz. A laboratory device called the "simple squeezer" was used in the tests.

Vertical Cutting Knives Boost Capacity of Forage Harvester

Vertical cutting knives and feed rolls permit a new forage harvester to handle large capacities efficiently. The vertical arrangement reduces the distance of crop travel between knife and blower. Feed rolls and cutting knives are powered through universal joints. The harvester has attachments for field-chopping corn and other row crops, windrowed hay or straw and standing hay or grass.

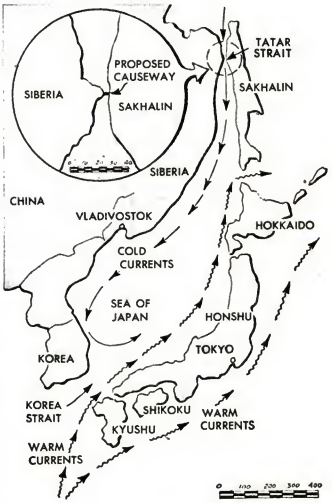




Ocean Dams Would Thaw North

Proposed 55-mile dam across Bering Strait would stop icebergs and cold currents from entering Pacific, allow warm currents to flow unhindered along coasts

Proposed five-mile causeway across the Tatar Strait would block cold currents that now flow down into Sea of Japan. Surrounding land would be warmed



TWO PROJECTS proposed by Soviet scientists would divert ocean currents to warm the frigid North. One of these would be a 55-mile dam connecting Siberia with Alaska. The other would be a five-mile causeway between Siberia and Sakhalin.

The Siberia-Alaska dam would keep icebergs and arctic currents out of the Pacific. Warm southern currents would sweep unchecked up the eastern shore of Siberia and down the western coast of North America. In addition, warm Pacific water would be pumped into the Arctic Ocean to change the frozen North into a blossoming landscape. A 2,000,000-kilowatt atomic power station would drive this artificial "Gulf Stream." By breaking the grip of the Arctic Sea over Siberia and Canada, the Russians say, the development would transform the climate of Northern Asia, America and northeast Europe.

American experts believe that the dam, which would have a maximum depth of 200 feet, could be built at immense cost, but would not be practicable..

The five-mile causeway across the Tatar Strait would join Siberia and Sakhalin Island to block cold currents which flow south from the Sea of Okhotsk into the Sea of Japan. Only the warm waters of the so-called Black Current would circulate in this body of water. It is claimed this would raise the temperature of the Sea of Japan some 35 degrees and warm the entire four main islands of Japan, Korea and the coast of Siberia bordering on the Sea of Japan. The causeway, according to Prof. B. A. Wasil of the Illinois Institute of Technology, would be no longer than many dams and causeways already built. Only 13 to 29½ feet deep, it would take two years to build and could be designed to resist the flow of ice. The project has long been dreamed of, and the idea does not belong solely to the Russians.

On the other hand, qualified American scientists believe that the proposed Bering Strait dam is a project in which there is no sincere interest on the part of any of the nations involved, and that the Soviet scientists have publicized the possibility of this dam on various occasions merely for propaganda purposes.

Glenn Winnie, sponsor of the mechanics' club, watches the boys do a tuneup. He is second from the right

TEEN-AGE MECHANICS

By Edward Janicki

Not all the work is on recent models. Here, a club member loosens the cables before he takes out the battery of this Model A Ford

THEY KEEP late hours at the Higgins Garage in Ferndale, Mich., on Mondays, sometimes past midnight, although the place closes at 6 p.m. It's not that there is so much repair business, nor is it the night for the weekly poker party. It's the night a bunch of boys—some 80 of them—get together to fix their cars.

The youngsters are members of the Teen-Age Mechanics Club, a group of boys, ranging in age from 14 to 18, who like to tinker with automobiles. They're not a hot-rod club. They are boys who own their own cars and want to learn how to repair them, to improve them and to make them safer.

Organized by Glenn Winnie, a car salesman for Higgins, the club is now in its fourth year. Winnie got the idea for the club one night during a Parent-Teachers-Students Association meeting in Ferndale. "Why can't we have a mechanics' club?" asked one youngster.

When the boys get in too deep and need help, the mechanics of the garage are available for professional advice

Winnie, father of four teen-age boys himself, took it from there, asked his boss, George Higgins, if he could use the garage one night a week. Higgins liked the idea, even donated a few dollars so the boys could buy some tools. The local Kiwanis club contributed 25 uniforms.

The boys now work with their own hand tools, paid for out of weekly dues of 25 cents a meeting. Higgins allows the boys to use the heavier equipment in the garage, such as welding torches, hoists, jacks and testing equipment. He says that in the three years the club has been in operation, none of his equipment has been damaged, and none of the hundreds of small hand tools owned by the garage have ever been touched.

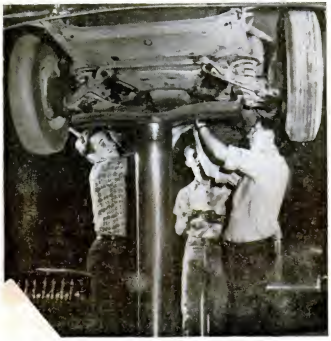
As can be expected of youngsters working with tools, there have been a couple of casualties. One youngster caught his finger in a car door; another "welded" a finger, but was back the following Monday eager to work on his car.

"We stress front-end and brake work," Winnie says. "And when these kids work on their cars they respect them. They drive more carefully than they otherwise would." The club has been lauded by various civic organizations and the police, and letters from as far away as Texas come in inquiring about it.

There's more to mechanics than repairs. The club members learn to grease and do other maintenance

Complete overhauls are part of the program. These members are pulling a flathead V8 before tearing it down

Left, occasionally the shop teacher from the local high school (at left in photo) stops in to advise



Thanks to the cooperating garage owner, members are furnished items like this lift and a welding outfit

Winnie himself supervises the club each Monday. Periodic meetings are held to discuss problems and purchase of tools. Occasionally a local high-school instructor of mechanics stops in to give Winnie and the youngsters a hand. A local automotive company donated a '53 Buick engine for the boys to experiment on.

The club not only keeps the youngsters out of mischief but is providing a stepping stone for some of them toward their ambitions. At least 15 of the boys are planning to become automobile engineers.

The boys are pledged to help anyone on the highway who is having auto trouble and all refuse remuneration for their services. One boy, who recently helped a motorist in distress, was offered $5. He turned it down, handed the motorist a card which read "We enjoy extending this courtesy to you as members of the Higgins Teen-Age Mechanics Club." On the other side the motorist read: "If appreciated, please drop us a card to let us know." There have been scores of grateful letters from motorists.

Activities are not limited to the club. Winnie occasionally takes the boys to local auto shows and on trips through automobile assembly plants. Where do they get the money? Winnie and Higgins help out. The boys had $300 in the bank several months ago, but had to buy special tools, such as torque wrenches and reamers. ★ ★ ★

Vacuum Cleaner Turns Lifesaver

During emergencies in the future, a housewife may pull out her vacuum-cleaner attachments, take out the resuscitator and save a life. The Air Force Medical Service has developed a vacuum-cleaner attachment that produces breathing cycles at any desired rate for an insensible person. As the person begins to breathe manually, the resuscitator adjusts itself to his own rate of respiration. One vacuum cleaner running on power from a disaster truck can keep seven persons breathing at once.

Lounge Chair Folds Into Case

You can carry a new lightweight, folding lounge chair in a small carrying case that is slung from the shoulder. The sturdy aluminum frame of the chair adjusts to two sitting positions and folds easily and compactly for carrying. The seat is made of water-repellent duck or of woven plastic that can easily be cleaned with a moistened cloth. The chair is designed for travelers and bathers.

Old Truck Top Serves as Boat

Dubliner Joe Acton has found the perfect use for an abandoned truck top. He's turned it upside down, installed a five-horsepower outboard motor, and now scoots up and down the river at a top speed of 16 miles per hour. The craft, which "will almost stand on its nose," came from the surplus-parts pile of Acton's automotive shop.

Joe Acton executes sharp turn as he displays the maneuverability of craft

Cab Riders Take a Number

People arriving by train in Philadelphia no longer have to scramble madly to find a taxi since one of the city's cab companies has installed a machine which issues numbered checks. The passenger takes his number, waits until it is called over a loudspeaker, and then gets into the appointed cab. The system was tested for a year to make sure of approval by the public before permanent installation.

Patient Helps Self to Pain Relief

Take a deep breath and say good-by to aches and pains. You won't notice the drill in your tooth, the knife lancing an infection or pain from any minor operation. A new rubber mask and cylinder, holding half an ounce of a recently developed drug called Trilene, does the trick. It is attached to the patient's wrist, and he applies the drug himself when he feels pain. After a few whiffs, the pain subsides. If the patient gets enough Trilene to become unconscious, his hand goes limp and the mask falls away. The inhaler was designed by Dr. C. R. Stephen of Duke University Hospital and George Newton of the University's Research Laboratory.

Tiny Prompter for Speakers Unreels Magnified Script

Busy executives can now give speeches aided by a midget version of TV's Teleprompter. The portable, electromechanical unit measures only 11½ by 8½ by 5½ inches and fits into an attached case. The case and unit together weigh less than 19 pounds. The text or notes that appear on the prompter are previously prepared on a special translucent sheet fastened to the roll. The roll, holding an hour-long speech, can be loaded into a prompter as easily as film in a camera. A hand control governs the speed at which the speech notes move across the screen.

550 New Drugs in One Year

The research firm of Arthur D. Little, Inc., reports that more than two thirds of the drugs prescribed today did not exist 10 years ago. In 1900, it was considered progress if one valuable medical substance was discovered in 25 years; last year about 550 new pharmaceuticals were introduced.

KEEPING UP WITH THE ATOM

NAVIES ALL OVER the world, thanks to the atom, may be experiencing the most convulsive change in naval design since the first fleet took to the high seas.

Here's some of the latest scuttlebutt concerning the seagoing atom.

Less than a year ago the success of the nuclear-powered submarine was a matter of speculation. Now Rear Adm. H. G. Rickover, who fought for the *Nautilus*, flatly predicts that all major naval ships started after 1960 will be powered by reactors.

Already the *Nautilus* is outmoded by submarines either under construction or in the planning stage. The *Sea Wolf*, the second atomic sub, will slip away on its shakedown cruise later this year. And another new sub undoubtedly will make naval history. It will be powered by two reactors instead of one, and will sport a teardrop-shaped hull. Half a dozen other nuclear subs are in the planning stage.

The atom also is finding its way into the hulls of surface ships. A light cruiser powered by multiple reactors and designed to fire guided missiles likely will be sailing the high seas by 1959. And it now appears that the first nuclear-powered aircraft carrier will be finished sometime in 1961. According to Adm. Arleigh Burke, this ship will be about as big as the USS *Forrestal*, though quite different in appearance as it will have no stacks and will boast two separate island superstructures.

Biggest challenge to naval designers right now is to shoehorn a reactor into the cramped hull of a destroyer. Another problem is the design of the first nuclear-powered naval plane. Five different companies are now working for the Navy on this project. As a matter of fact, naval men predict the first atomic plane will be a seaplane.

The goal, of course, is to rebuild the Navy from the keel up into a high-speed atomic-powered striking force that will not suffer the drag of today's slow-moving tankers.

This country naturally has no monopoly on plans to power ships with nuclear fuel. According to reports, the Soviet Union is developing a nuclear-powered icebreaker 512 feet long. The ship, unique in conception, apparently will shoot out jets of steam, produced by the heat of the reactor, to melt a passage through the ice. Its speed will be about 24 knots.

Norway, too, is active in atomic-ship design, though in the merchant-fleet field. She may well be the first country to produce an atomic ship that can compete economically with existing ships. Since the war, Norway has built her merchant fleet into the second largest in the world, but because of the scarcity of domestic fuel the fleet is dependent upon imports of fuel oil. Norway is attempting to obtain enriched nuclear fuel from this country.

No, that's no Navy man in the weird picture below, though someday sailors may have similar outfits on hand. The man with the antennas sprouting from his helmet has long been cartooned. Now he is here.

At the Hanford plutonium plant, employees don this eerie costume when they check the radiation intensity in a "hot" zone. The mask and clothing protect them from radioactive contamination. The man in the mask is reporting instrument readings via a throat microphone. His words are broadcast to a radio receiver elsewhere.

Periscopes won't be practical for lightplanes, but CAA has already approved a rear-view mirror for them

Periscopes for Airplanes

By Paul N. Janes

LONG AN INTEGRAL PART of the submarine, the periscope is now being carried into the skyways in the hope of providing increased safety for air transportation. Some research experts of the Civil Aeronautics Administration predict that every air transport will be equipped with two periscopes in the years immediately ahead.

The idea behind the use of the special sighting equipment is to aid a pilot in avoiding mid-air collisions with planes which approach his craft from angles outside his normal field of vision.

Information provided by radio to pilots from on-the-ground radar observers is exceedingly helpful in many instances, but sometimes a pilot does not learn quickly enough that another airplane is heading his way.

Aeronautical engineers say the periscopes definitely won't be practical for use in light airplanes, but they point out that the CAA already has approved a rear-view mirror designed to give a lightplane pilot increased visibility.

The big-plane periscopes would be intended for use during landing and take-off operations, and would be expected to be of most value in bright daylight when air-safety officials say mid-air collisions are most likely to occur.

Operation of the periscopes in airliners would call for the addition of an extra crew member in some instances, as the pilot and copilot, busy during landings and take-offs, would have no time to make periscope observations. But proponents of the periscope plan say an airline stewardess could make the observations without interference with her other duties.

One periscope would have an "eye" in the bottom of the plane's fuselage, while the other would search the sky above. A single observer would operate both, one at a time, inspecting the areas below and above the plane, and at the sides and the rear. A dial on the pilot's instrument panel would show him just where the periscope "eye" was looking. When the periscope observer sighted an approaching plane, he would press a button to signal the pilot who, by looking at the dial, could tell where the neighboring plane was flying.

The periscope is described by some CAA experts as "the best solution we have found so far for the terminal area mid-air crash situation." They add, though, that "it may not be the final answer."

One periscope installed in a CAA transport for test purposes was developed by the Farrand Optical Company of New York City. It utilizes a great number of lenses, and has a rotating head or "eye." It can be constructed in any length, depending on the size of the airplane.

Alan L. Morse, head of the CAA Aircraft Division, emphasizes that he and his fellow workers are most concerned about daytime mid-air collisions. Contrary to the belief of many persons, it's much easier to have a mid-air crash in bright daylight than at night or in soupy weather, Morse asserts.

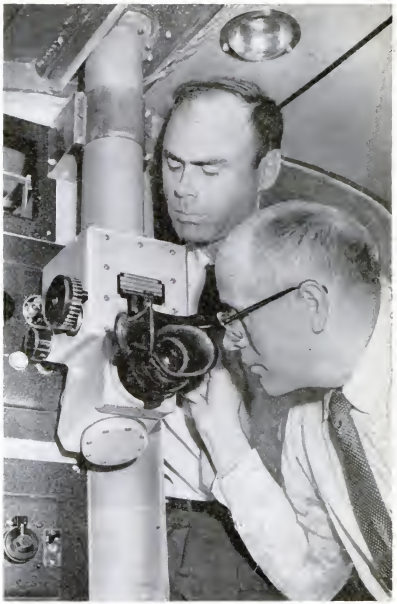
"Of course, air traffic is heavier in the daytime and in good weather, but other factors enter into the situation. On a clear night, you can see a plane with flashing lights easily when it is 30 miles away, but a plane can't be seen easily in daylight beyond three miles."

Thomas M. Edwards, chief of the instruments and accessories branch of the CAA Aircraft Division, emphasizes that some system for increasing the "conspicuity" of airplanes should be coupled with periscopes. A good many conspicuity techniques are being evaluated. Fluorescent paint patterns have been found effective close-up, but not at long distances.

A solar reflector which uses the sun for power and has a rotating omnidirectional mirror also is being tested, and has been found to be useful up to five miles.

Yet to be tested in flight is high-intensity daytime lighting calling for use of a mercury-arc vapor-type lamp capable of producing 2,000,000 candlepower in a concentrated beam.

For flying outside of airport areas, airplanes of the future probably will depend on some type of proximity warning device utilizing infrared rays or UHF or VHF radio waves. But this type of equipment probably would be valueless in airport areas where the presence of so many planes would keep the warning equipment in almost continuous operation. ★ ★ ★



Periscope being evaluated in flight tests by Civil Aeronautics Administration representatives for use in transport planes

This is what a lightplane pilot sees in his rear-view mirror. Such visibility of nearby planes provides additional safety

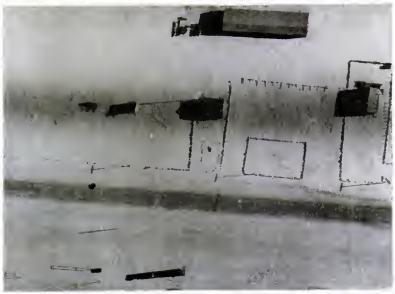
Water-Ski Towboat Steered by Skier

Automation takes over even in the water-skiing field, as two Austrian banking officials come up with a self-piloted towing rig which eliminates the speedboat pilot. The rig consists of a 6½-foot motorboat, steered and controlled by a 10-foot extension arm. Already in the water, the prototype travels up to 25 miles per hour but the inventors hope to increase the speed to 50 when the design is refined and ready for the market. The 18-horsepower engine on the boat is equipped with an electric starter, and in the event that the skier falls into the water an automatic cutoff stops the engine immediately. The inventors believe that the rig will cost about one fourth the price of a standard motorboat of comparable speed and power.

Steering and controlling his own towboat, water skier skims water at 25 miles per hour. Dead-man control cuts engine if skier falls

Pilotless Photo Drone Takes Aerial Pictures

Combat aerial photos in future wars will be taken without risking the lives of pilots or aerial photographers. Developed by the U.S. Army Signal Corps, a small, radio-controlled, camera-carrying drone will make this possible. The drone, officially designated as the RP-71, can operate in all kinds of weather, and take still or motion pictures anywhere from several hundred feet to more than four miles above the earth. One big advantage of the drone is that it requires no airfields from which to operate, since it is jetted from a portable launching catapult. Once in the air, however, it is propeller-driven by a gasoline motor. A control operator on the ground guides the craft to its destination and back. Then the engine is stopped and the drone comes down by parachute. With it, tactical commanders can have aerial photos in less than an hour.



Lower photo at right is aerial view of Camp Irwin, Calif., taken at 500 feet by photo drone. Above, drone on catapult ready for launching

RADIO TELEVISION ELECTRONICS

6-TRANSISTOR SUPERHET PORTABLE

By James A. McRoberts

IT'S not the cost, it's the upkeep" is a common lament of outdoor fans who like radio entertainment. If you buy batteries "by the dozens" to satisfy the appetite of your portable radio, try building this all-transistor set. You'll find that upkeep of this set will probably save enough during the first season's operation to compensate

Six-inch-long chassis is made from sheet aluminum. Use actual parts as templates for exact hole spacing

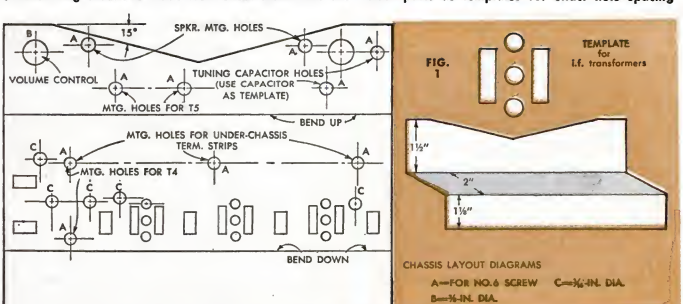
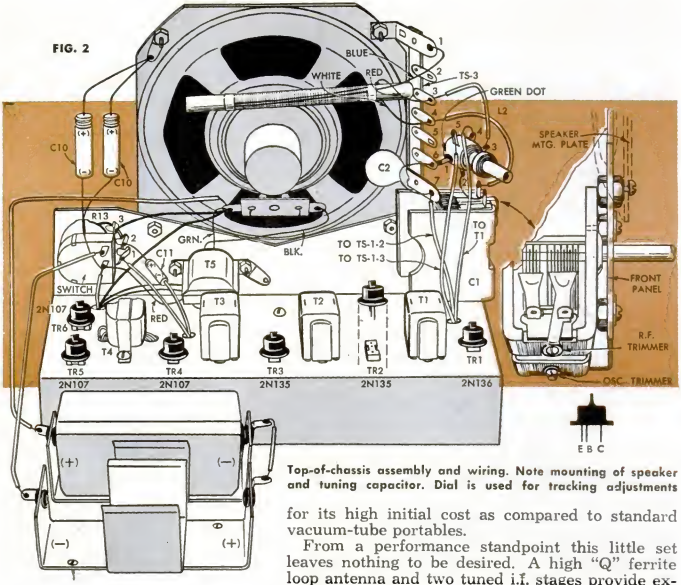
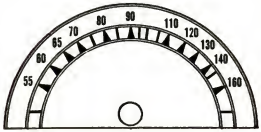


FIG. 2





Top-of-chassis assembly and wiring. Note mounting of speaker and tuning capacitor. Dial is used for tracking adjustments

for its high initial cost as compared to standard vacuum-tube portables.

From a performance standpoint this little set leaves nothing to be desired. A high "Q" ferrite loop antenna and two tuned i.f. stages provide excellent gain and selectivity, while a push-pull output stage and 4-in. speaker impart unusually good tone quality. Class B operation of the output stage assures maximum economy.

If you've never built a radio before, better skip this project until you've tried a few simpler ones. But, if you're handy with a soldering iron and have done some previous radio building, you should have

Initial wiring. Black dots indicate connections to be soldered

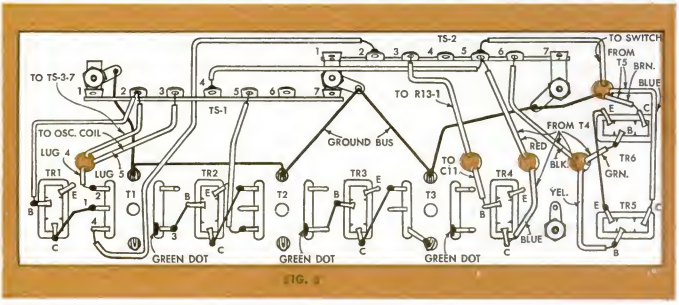


FIG. 3

no trouble following the recommended procedure.

Construction

Step 1. The chassis: Cut, drill and form the chassis, using a piece of "do it yourself" aluminum which is available from most hardware stores. Fig. 1 shows the approximate location and sizes of the mounting holes. Holes for the transistor sockets and i.f. transformers should be cut slightly undersize and filed to the correct dimensions using the actual parts as guides.

Step 2. Mounting the parts (See Fig. 2):

1. Insert transistor sockets through the chassis from the top and fasten these in place with their retainer clips.

2. Mount audio transformers (T4, T5) and terminal strips TS-1 and TS-2. A common mounting screw is used for T4 and one end of TS-1. Insert a shakeproof solder lug under each terminal-strip nut.

3. Mount the volume control and i.f. transformers. The correct mounting positions for the i.f.s are shown by the green dots in the under-chassis view of Fig. 3. Though identical in appearance, T3 is electrically different from T1 and T2. See parts list for identification. To hold the transformers securely, bend their mounting lugs underneath the chassis.

4. Mount the speaker and tuning capacitor (see Fig. 2) with No. 6-32 machine screws. These screws should not exceed 3/16 in. in length or they will interfere with the opening of the capacitor plates. Longer screws may be used by inserting a nut between the capacitor and speaker frames and the panel, as shown in the illustration. Terminal strip TS-3 is mounted on the speaker. To prevent lug 7 of this strip from touching the speaker frame, break off its mounting base. Tape a piece of heavy cardboard to the front of the speaker to prevent any possible accidental damage to the cone.

Step 3. Initial wiring: Begin the wiring with the ground bus which shows as a heavy, solid line in Fig. 3. This is a length of bare No. 22 wire which must be kept close to the chassis. All other wires in Fig. 3 should be as short and direct as possible. Solder only those connections indicated with a black dot. To other connections, additional parts will be added in the subsequent wiring view.

Wires running from points below the chassis to components mounted above may be properly connected by comparing Figs. 2 and 3.

Step 4. Final wiring: Complete the under-chassis wiring as shown in Fig. 4. Position all parts so that their leads cannot short against those of other components. Insulate any leads which might contact other bare wires.

Connections to the i.f. transformer lugs and oscillator-coil terminals should be soldered as quickly as possible. Excessive heat to those terminals may damage the fine coil wires.

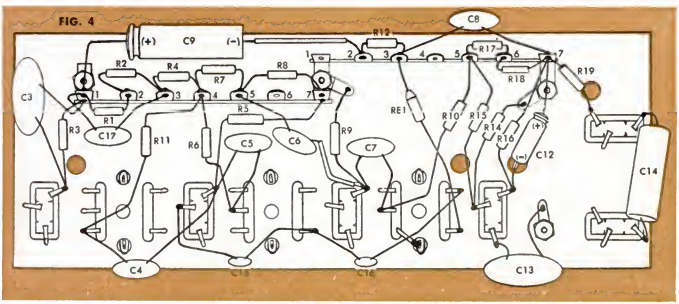
Observe polarity (+ and —) on all electrolytic capacitors and do not permit their metal cases to short against the chassis or other wire leads. Insulate them with rubber tape if necessary.

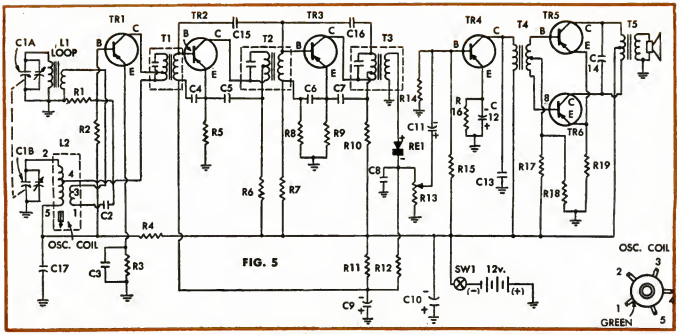
The loop antenna may be temporarily taped to the speaker frame while its leads are being wired into the circuit.

Step 5. Final testing: (Transistor leads should be left long until the unit has passed the following tests. Then they may be cut to approximately ¼-in. lengths.)

After checking the completed assembly against pictorial and schematic diagrams, install the batteries with the polarity as shown in Fig. 2. *With no transistors in the sockets*, turn the volume control to maximum. Plug transistor TR-6 into its socket

Final under-chassis wiring pictorial. Keep all bare wires well separated to prevent short circuits





Schematic diagram of 6-transistor portable radio

making sure that the various leads go into the proper socket holes. A faint click will be heard as the transistor leads contact the socket pins. Leaving TR-6 in its socket, plug in TR-5. Again, a click should be heard. Continue this procedure with TR-4, TR-3, TR-2 and TR-1, in that order. With each insertion the volume of the click should increase. If a transistor fails to produce a click, turn off the set immediately and remove the transistor from the socket. Carefully check the socket wiring to locate a possible wiring error.

I.f. alignment: Because original factory

(Continued to page 238)

Flexible plastic retainers hold antenna in cabinet

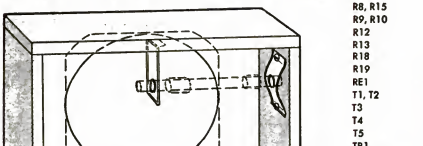


FIG. 6

LIST OF MATERIALS

SYMBOL	MANUFACTURER'S NO.	DESCRIPTION
C1A, C1B	Lafayette MS-261	2-gang variable, max. cap.—123 and 78 mmfd.
C2, C4, C5, C6, C7, C8, C17	Lafayette C-601	.01 mfd. ceramic
C3, C13	Lafayette C-601	.005 mfd. ceramic
C9	Sprague TE-1128	10 mfd., 12-v. electrolytic
C10 (2 reqd.)	Barco P25-50	100 mfd., 25-v. electrolytic (two 50 mfd. units in parallel)
C11	Barco PT12-2	2 mfd., 25-v. electrolytic
C12	Sprague TE-1087	10 mfd., 6-v. electrolytic
C14	Lafayette X1060	.05 mfd.
C15, C16	Lafayette C-601	5 mmfd. ceramic
L1	Lafayette MS-264	loop antenna
L2	Lafayette MS-265	oscillator coil
R1		27,000 ohms, ½-watt
R2, R11		100,000 ohms, ½-watt
R3, R16		1,000 ohms, ½-watt
R4, R14		6,800 ohms, ½-watt
R5		330 ohms, ½-watt
R6, R17		4,700 ohms, ½-watt
R7,		47,000 ohms, ½-watt
R8, R15		33,000 ohms, ½-watt
R9, R10		2,200 ohms, ½-watt
R12		3,300 ohms, ½-watt
R13	Lafayette VC-27	5,000-ohm control with switch
R18		68 ohms, ½-watt
R19		12 ohms, ½-watt
RE1	Raytheon 1N295	crystal diode
T1, T2	Lafayette MS-268	1st and 2nd i.f. transformer
T3	Lafayette MS-269	3rd i.f. transformer
T4	Lafayette AR-109	audio-interstage transformer
T5	Lafayette AR-119	audio-output transformer
TR1	GE 2N136	r.f. transistor
TR2, TR3	GE 2N135	i.f. transistors
TR4, TR5, TR6	GE 2N107	audio transistors

MISCELLANEOUS

QUAN.	DESCRIPTION
1	4-in. speaker with 3.2-ohm voice coil
6	transistor sockets with retainer clips
2	6-v. batteries, RCA VS-068
3	terminal strips, CINCH 55A
2	battery holders, Lafayette MS-175

assorted machine screws, nuts, lock washers and ground lugs, hookup wire (No. 22), rosin-core solder, knobs, material for chassis and case

(ALL ELECTRONIC PARTS USED IN THE MODEL WERE OBTAINED FROM LAFAYETTE RADIO, 100 SIXTH AVE., NEW YORK CITY)

the POPULAR MECHANICS CRAFTSMAN

FROM HULL TO FINISHED BOAT

Buy a Laminated Hull—Complete It Yourself

By E. F. Lindsley

CUSTOMIZING a molded-plywood hull was the method I used to build a boat that fitted my particular needs, required the minimum amount of time to assemble and was priced within my budget. The boat was to be a family outboard runabout, so seats, center deck and stern deck, as well as foredeck, were required. Decks in center and stern are removable, as are the seats and seat backs. When the boat is used for a fishing trip these items are removed to provide plenty of room for fishermen and their gear. The foredeck is permanently attached, since it provides additional hull rigidity and dry storage in rough water. If the boat were to be used only for fishing, where more room is needed, the foredeck could be replaced by a simple V-shaped breasthook.

Although a laminated-plywood boat hull can be purchased in any state of assembly from the raw hull up, Fig. 1, to reduce construction time the one chosen had a stem and transom installed at the factory. The transom was braced by

1. Boat can be purchased in any form from raw hull, shown above, to completed boat, ready for painting

2. Choice of materials and fittings are strictly up to the builder; in the boat shown below, plywood rear deck is removable

3. Boat is hoisted to convenient working height and marine surfacing putty is used to fill imperfections

4. Before installing cap rails, top edge of hull is planed to be flush with top edge of gunwale strips

"knees" that fit against the transom and against hull stringers that also had been installed by the factory. If you install your own transom, use the best-quality wood available and use extreme care in gluing and securing it to the hull. The transom must carry the full weight of an outboard engine and resist the thrust of the propeller as well.

Spray rails and gunwale strips can be installed by the builder, but were purchased "factory installed" to save time. Although light in weight, a laminated-plywood hull is bulky and awkward to handle. For this reason it was necessary to use two light block and tackles, one at the bow and one at the stern, to hoist the hull to a convenient working height. The blocks were fastened to overhead beams in the garage and the hull could be pulled up out of the way so an automobile could be driven in. Since most garages do not have a high ceiling, it is best to hang the boat so it is over the area where the hood of a car is located. The boat can be raised high enough to clear the hood.

After trimming and sanding the hull, marine surfacing putty is used to fill minor imperfections in the plywood, Fig. 3. Then one or two coats of primer are applied, which protect the wood from the bumping and rubbing it will receive while the boat is being finished, as well as providing an undercoating for the final coat of paint.

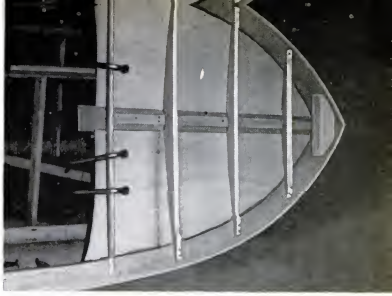
The upper structure of the boat is a matter of individual choice. If desired, solid-mahogany cap rails, decks, seats and seat backs may be installed, Fig. 2, for appearance' sake. In a boat used only for fishing or other rough service, these items could be replaced by simple chafing strips along the gunwales, with a plywood foredeck attached directly to the strips.

It is characteristic of a laminated-plywood hull for the top edge to curl in slightly, thus reducing the beam at this point.

5. Below, removable rear deck is assembled on hull to assure good fit. Marine glue is used in all joints

6. Plywood is "clamped" to deck beams while glue dries by using finishing nails in wooden blocks

7. Hull-spreader jack can be made from scraps of wood or auto bumper jack can be used as shown here



8. Foredeck and cap rails can be assembled and installed as a unit, as above, or assembled on boat

Before marking the shape of the cap rails, determine from the manufacturer's specifications what the beam should be and use a hull-spreader jack, Fig. 13, to obtain the correct dimension. The jack can be made from scraps of wood to the shape indicated. A wooden cam forces the jack shoe outward when one hand is used to apply pressure on the cam lever. The hull spreads easily. An automobile bumper jack also could be used. Near the bow the jack is inserted between the gunwales, Fig. 7. At wider points, one end of the jack is fitted against a bottom stringer and the other end against a wooden block clamped inside the gunwale. Cap rails are bandsawed to shape from solid stock, Fig. 9. The forward portion of the cap rails should be grooved to receive the edges of the plywood foredeck, as detailed in Fig. 13, to assure a strong, watertight joint. A pattern can be made for the cap rails by laying light cardboard along the edge of the hull and tracing along it with a pencil or, with some assistance, the stock itself can be held on the edge of the hull and marked. Before installing the cap rails, detail Fig. 13, trim the edge of the hull so it is flush with the gunwale strips, Fig. 4.

The plywood foredeck, deck beams and cap rails can be assembled and installed as a unit, Fig. 8, or assembled on the boat, Fig. 10. The stern deck is removable, but is assembled on the boat to assure a good fit, Fig. 5. One method of "clamping" the plywood to the deck beams while the glue is drying is to use thin blocks of wood held with finishing nails. To remove the nails, split the blocks and the projecting nailheads can be grasped readily with a hammer claw or nippers. Fill the nail holes with marine putty, sand smooth and varnish. For a neater job of covering the heads of countersunk screws that are used to fasten the horizontal braces between the hull and transom, wood pegs wiped with glue are

9. Cap rails are bandsawed from solid stock. Wood choice is up to builder; mahogany was used here.

10. Beams of removable decks are attached to underside of cap rails by means of bolts and wing nuts

11. Heads of countersunk screws are covered by wood pegs instead of putty. Pegs are cut flush with surface

12. Seats fit across inner thwarts, are held by blocks. Seat backs pivot forward, are separate and removable

tapped into place, Fig. 11. When the glue has set, cut the pegs flush to the wood with a chisel and sand smooth.

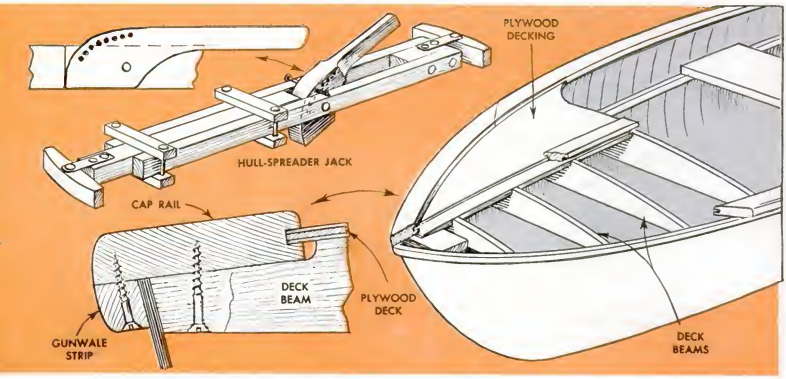
Seats are cut so they fit on inner thwart rails and fore and aft movement is prevented by blocks screwed and glued to the rails. Seat backs pivot forward and can be left out when an open boat is required, Fig. 12. The back of the rear seat gives access to the area under the rear deck where the gasoline tank and battery are located.

The center deck is another optional item, installed primarily for appearance, although it does provide a rigid cross bracing at the center section of the boat. Like the rear deck, the center deck is built on beams that extend across the boat. As shown in the lower left-hand detail in Fig. 13, the beams extend under the cap rail, and are screwed to it. In the case of the center and rear decks, carriage bolts are set in the cap rail and wing nuts are used to hold the beams up under the cap rail.

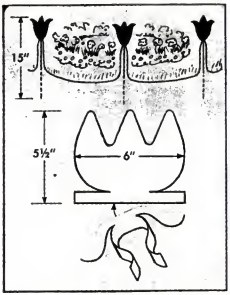
Hardware and fittings for the boat are determined by the use for which the boat is designed and how much is to be spent. If the boat is to be used in a salt-water area, stainless-steel fittings would be less affected than brass, though more expensive.

The lead illustration of this article shows the boat on a test run. The bow is riding too high because of the weight of the motor and the operator. Remote controls for the motor later were installed so the boat could be controlled from the front seat. Moving the driver to a forward position brought the center of gravity forward allowing the boat to ride in a more level position. ★ ★ ★

13. Cross section shows assembly of gunwale strip, cap rail and deck beams. Hull-spreader jack is wood



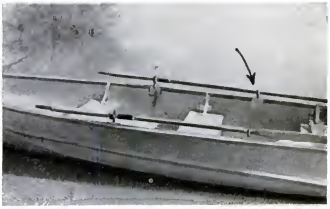
Lighted Flower Beds Add to Color of Lawn-Party Decorations

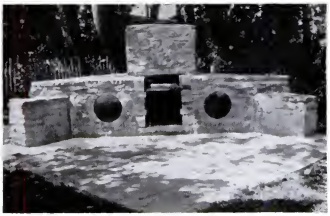


An added decoration for nighttime lawn parties can be obtained by illuminating flower beds and garden walks with strings of outdoor-type Christmas-tree lights mounted in sheet-metal reflectors shaped and painted to resemble flowers. Tin cans will furnish the metal for the reflectors, which are cut and bent as shown in the detail. A ½-in.-high strip at the base of each reflector is bent to form a clip that grips the light-bulb socket. Stiff coat-hanger wire in 15-in. lengths is soldered to each reflector to provide a stand that can be pushed into the ground. White bulbs should be used if the lights are intended for general illumination, but colored bulbs will do more to enhance the appearance of adjacent flowers.

Oarlocks Serve Double Purpose

Two pairs of mounted oarlocks not only give you a choice of rowing positions in a small boat, but the unused pair also makes excellent rests for idle oars, as shown. Objection to the empty horns as an accident hazard is overcome because they are filled by the oars. If drop-type oarlocks are used, they can be dropped inside the gunwales when not in use.





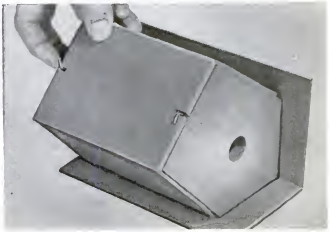
Nail Kegs Set in Fireplace For Use as Wood Boxes

One homeowner, building an outdoor fireplace in his back yard, installed two nail kegs as permanent wood boxes. The kegs, 18 in. deep, were treated with creosote as a preservative and set into the wings of the fireplace as shown in the photo. Two harrow disks serve as covers for the boxes.

Jerome Narveson, Northfield, Minn.

Removable Birdhouse Floor Makes Cleaning Easy

Two screw hooks will hold a removable floor of a birdhouse secure, and yet permit cleaning which is appreciated by birds that prefer nesting in clean houses. Saw two slots opposite each other in the floor cut from ⅛-in. tempered hardboard, which has less tendency to warp than wood. Drive 1-in. brass screw hooks into the ends of the house so the L-shaped ends can be turned sidewise to lock the floor of the house in place.



WTM '57

TACKLE BOX of Plywood

By George X. Sand

This lightweight tackle box can be carried either by side handles or an adjustable leather carrying strap

Ample storage space is provided in the lid and trays for a good selection of lures, leaders, line, camera and film. Fishing reels, two vacuum bottles and miscellaneous gear are easily stowed in the bottom

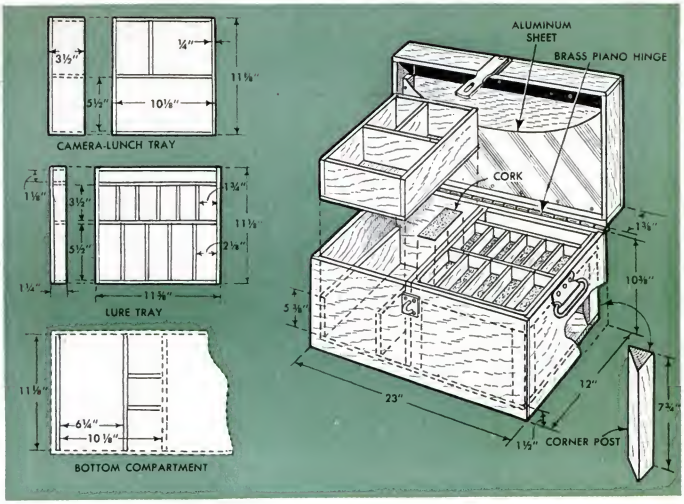
WANT an inexpensive tackle box that will remain dry inside under most conditions and provide adequate storage space for all your fishing accessories, a camera and a hearty lunch? This marine-plywood box will do the job. The bottom is partitioned to provide compartments for two vacuum bottles, reels and similar equipment. Above these compartments are trays for lures, camera, etc., and a large pocket inside the lid stores flat articles such as line, leaders and snelled hooks. Two brass handles and a leather carrying strap offer alternative means of carrying it.

Constructing the Box

First step is to build the box of ⅜-in. plywood. Cut the plywood according to the dimensions given in the diagram. Be sure to allow 1⅜ in. for the lid in the over-all height. Sand all members smooth, apply waterproof glue along each surface to be joined, and nail the top, side and end pieces together with 1-in. brass brads. You now have a box that is enclosed on all sides but the bottom. The top will be cut off later to make the lid. This will assure a perfect fit between box and lid.

Next, turn the box over and glue the vertical partition in place, then the tray-support members in both compartments, each 1½ in. up from the bottom. For added strength use 1-in. brads and allow the glued surfaces to set overnight. Wood clamps can be used to advantage here, although they are not a must.

After the bottom of the box is glued and nailed in place, the top is sawed off to make the lid, which will provide storage space for miscellaneous flat items when an aluminum sheet is screwed to ¾ x ½-in. wood spacer strips to form a pocket between the lid and metal, as indicated in the detail. The lid is attached to the box with a 23-in. strip of brass piano hinge.



Next, a carrying handle is bolted to each end of the box. Use small brass bolts and countersink the heads to fit flush on the inside. The same procedure applies for mounting the lock hasp and staple, which are centered at the front of the box. Two lengths of doubled ¾-in. leather strap fitted with adjustable buckles and snap hooks can be snapped on the handles for one-hand carrying.

Trays

The lure tray and the camera-lunch tray are made from ¼-in. plywood. These may be partitioned as suggested or modified to suit individual requirements. After the partitions have been glued and nailed in position, glue thin sheet cork in the bottom of each lure compartment to protect the finish of the lures.

Under the camera-lunch tray, and acting as a support for one side of it, are the vacuum-bottle and miscellaneous-equipment storage compartments (lead sinkers, first-aid equipment, etc.). The longest member is cut from ⅜-in. plywood while ¼-in. material is used for the short partitions. All three pieces are glued and nailed to the bottom and sides of the box to complete construction of the tackle box. Additional hooks, brackets and pockets can be installed in the box where desired to accommodate some special gadget or extra tackle. ★ ★ ★

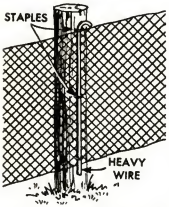
Identification Badges Fastened to Clothes Without Pins

Factory employees who are required to wear identification badges can save the wear and damage to outer garments where the badges are pinned by using discarded ball-point pens or automatic pencils to carry the badges. Simply drill a tiny hole through the pen or pencil cap, insert the badge pin and fasten it. A bit of solder may be used on the clasp for security. Changing the badge from one garment to another is then as simple as shifting a pen from one coat to another.—Glen F. Stillwell, Manhattan Beach, Calif.

Pan on Broomstick Is Portable Outdoor Table

For a portable table that can be used outdoors with a lawn chair, sharpen one end of a 3-ft. length of broomstick or other suitable material and attach a piepan or serving tray to the opposite end. Fasten the pan with a wood screw, inserting a washer between it and the post so that the pan can be rotated to reach objects situated on the far side of it. To set up the table simply thrust the pointed end into the ground beside your chair. It can be used to hold pencils, reading matter, stationery and other light objects. A set of these tables made from matching serving trays are perfect for serving outdoor snacks. Partitioned plastic plates can be similarly mounted for use as paint palettes.

An Easy Method for Temporary Enclosure With Wire Mesh



When putting up a temporary fencing to protect flowers or confine pets, use of this method of attaching the wire will permit quick installation and removal. Staples, placed according to the style and height of the fence and aligned vertically with each other, are driven part way into wooden posts. The wire mesh is hung over the staples, and lengths of stiff wire with one bent end are slipped over the fencing through staples.

Tape Tab Removes Friction Lid

Press-on jar or can lids can be removed easily if tape tabs are placed under them when sealed. Adhesive tape is cut in pieces about 2 in. long, and each piece is folded lengthwise for about two thirds its length, leaving an area of exposed tape, which is then pressed to the inside of the lid so that the folded section extends outside. The projecting tape serves as a handy tab when the cover is placed on the container, and pulling straight up on it will raise the lid in a jiffy.

Victor H. Lamoy, Upper Jay, N. Y.

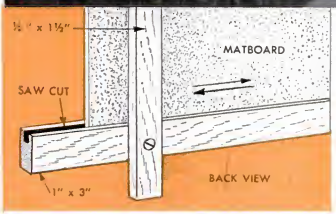
Aluminum Foil Protects Barbecue Grill from Corrosion

Sheet aluminum foil used to line the basin of a barbecue broiler protects the metal from corrosion due to heat and moisture. Because the foil stays bright to reflect the heat it also increases the efficiency of the grill.—Clinton R. Hull, Santa Ana, Calif.

Paper Maps Pasted to Muslin

Good-quality paper maps can be protected and preserved by pasting them to sheets of muslin with ordinary wallpaper paste. The maps then can be tacked to rollers made from lengths of broomstick and kept rolled up and out of the way when not in use.

WTM '57



WALL RACK
DISPLAYS YOUR FAVORITE PHOTOS

Why not get your favorite photographs out of hiding and make them part of the decorative theme of your home? This simple rack will enable you to display the photographs neatly.

First, mount the photographs on heavy matboard by means of dry-mount tissue, which is available at most photo-supply stores, then slip the matboard into a grooved frame or wall rack that is screwed to a wall in some location where the photographs will be displayed prominently. To change the "scene," it then is only necessary to slide out one matboard and slip in another on which are different photographs.

The frame can be made to any dimension proportional to the wall on which it will be located. The slotted horizontal pieces are 1 x 3-in. stock, and the vertical supports are ½ x 1½-in. material. Size of the lumber can be increased for a larger frame or decreased for one that is smaller. Occasionally wax the grooves.

Wire Grating in Solvent Can Holds Brushes Above Sediment

Paint solvent will last longer and brushes will remain cleaner if a grating made from a piece of hardware cloth is fitted in the bottom of the can in which the brushes are stored in solvent. Bend the hardware cloth to form a U-shape as shown. Residue from the brushes settles down through the grating and is not stirred up each time another brush is inserted in the can. Occasionally strain the solvent to remove paint residue.

R. F. Donavan, Guttenberg, N. J.

WINDOW-CONDITIONER INSTALLATIONS

Mitchell

Adapted to installation in old and new homes, new homes especially, this unit features a cooling chassis which can be purchased separately and added

Push-Button

NO ONE UNIT of a modern home will afford the comfort to every member of your family that a modern air conditioner will provide. And when it is paired with an automatic heating unit you really have year-round push-button control of the climate within your home.

Air conditioners fall in two general categories, window units to cool one or two rooms and central units to cool the entire house. The window units have certain advantages which make them desirable for those who can best utilize this type of air conditioning. No ductwork is required and no special wiring, except for the larger sizes, and the units can be installed either in the window, under the window or above it, or through the wall. Certain of the newer models of room conditioners can be installed without noticeable projections either inside or outside the room. The units are highly efficient and operate under average conditions at very low cost. Nearly all such units can be equipped with temperature controls.

Electrically powered home air conditioners operate on essentially the same principle. Referring to the simplified diagram on page 160, which illustrates a room-type conditioner, the motor-driven compressor,

Emerson

New unit that fits in a casement is of panel design. Installation extends only a few inches beyond the draperies

Carrier

Unit heating and air conditioning in the latest design fits in utility room with condenser unit outside house. Note compact, neat design. Temperature is automatically controlled at all times

Climate Control

A, is the heart of the refrigerating system. Starting the refrigerating cycle at the evaporator, or cooling coil, C, the refrigerant changes from a liquid to a gas within this coil. In the changing state the refrigerant absorbs heat from the coil which in turn absorbs heat from the air blown by fan E through the filter, F. The heat-carrying gas then is conducted (through tubing) to the compressor, A, where it is compressed and carried to the condenser coil, B. Within the condenser coil the refrigerant (under pressure) condenses back to a liquid, releasing the heat it carries to the coil which, in turn, dissipates the heat to the air circulated over it by fan D. The liquid refrigerant then returns to the cooling (evaporating) coil to repeat the cycle. After passing through the filter, F, and over cooling coil, C, the cooled and filtered air is discharged into the room, or through a duct system if the installation is of the central-unit type designed to cool the entire house.

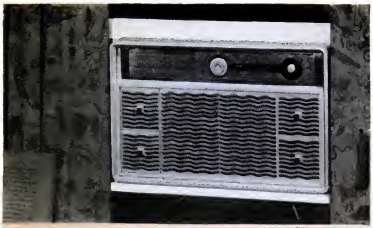
The larger installations consist essentially of the same units as those in the window conditioners except that size and capacity of the units increase and often they are located separately, the heavy condensing unit being placed outside where its weight is no installation problem. This type of installation is typical where the existing heating system can be utilized to circulate cooled air, the cooling, or evaporator, unit being installed in the plenum of the furnace. In this case the condensing and cooling units are connected by means of copper-tubing lines to carry the refrigerant. Such systems are now made sufficiently flexible to solve almost any special installation problem. In the larger installations (other than window conditioners) air, which has become heated and made humid through indoor use, is taken back from the rooms by means of ducts and recirculated after being cooled and freshened. In this respect, the larger installations differ from the window conditioners, which draw air from outside the house. Some of the larger installations make use of water, which is passed through

WIRING REQUIREMENTS

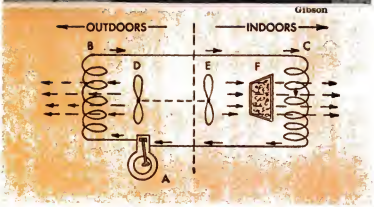
Hp.	Voltage	Separate Circuit?	Wire Size	Fuse With Time Lag
⅓ hp.	115	No	—	—
½ hp.	115	Yes	No. 14	15 amp.
¾ hp.	115 or 230	Yes	No. 12	20 amp.
1 hp.	230	Yes	No. 12	20 amp.
1½ hp.	230	Yes	No. 12	20 amp.

Rheem

Here cooling unit is located in the furnace plenum, with the condenser located either in another room or entirely outside the house. Copper lines provide for circulation of coolant between the two units



Gibson



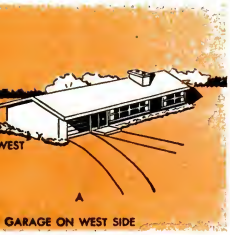
Servel

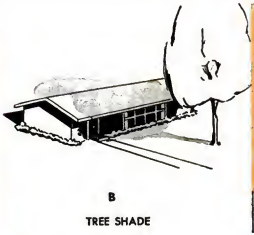
This window air conditioner mounts flush with the droperies. It is also adaptable to built-in or through-the-wall installations. Has six-position, push-button control. Styled to harmonize with room colors

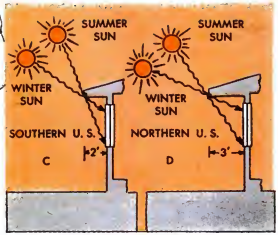
cooling towers located on the roof or anywhere above grade where there is adequate air circulation, the purpose of the tower being the dissipation of heat through evaporation of condensate.

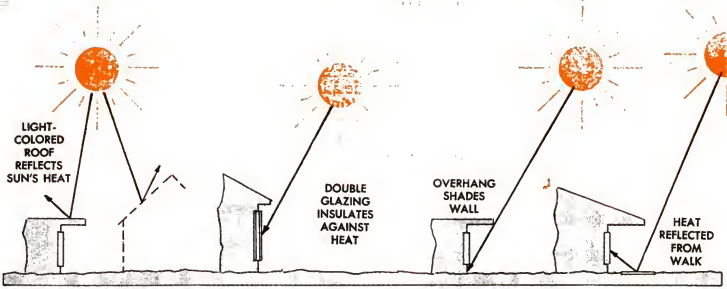
However, manufacturers have tended to concentrate on the waterless systems in the effort to solve the twin problems of space requirements and economy. One variation from window and central-unit cooling is the self-contained console-type cooling unit, for use with or without duct systems, especially designed for cooling two to four rooms at a time. Such units are individually somewhat less in initial cost and they have an added advantage in that they can be installed without cutting into existing walls and floors to install a duct system. Some other conditioners provide two complete refrigerating systems in each

Careful planning of a new home can do much toward lightening the load on the air-conditioning equipment. Tree shade is important, even that from a small tree can make an appreciable reduction in operating cost









unit, only one of which is in operation during normal weather conditions. The second unit cuts in only when the load increases beyond normal capacity of first unit. This arrangement is said to effect a marked decrease in operating cost. During this year another manufacturer will offer an all-year gas-operated air conditioner which will provide both heating and cooling for the entire home by means of a single gas-operated heat exchanger.

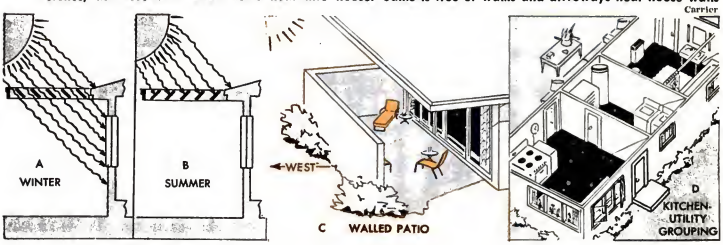
If you are planning a new home, probably the best and least expensive installation is the central unit that cools in summer and heats in winter, both processes being thermostatically controlled to effect the greatest operating economy. The added cost of the air-conditioning equipment over that of a heating installation alone can be at least partially offset by the construction savings possible in a completely air-conditioned home. Since cross ventilation in the air-conditioned home no longer need be a design factor, economical rectangular floor plans are possible, featuring fixed window sash, elimination of screens and construction of solid walls on the east and west exposures. For those whose homes are equipped with forced-air heating systems the next best thing is to air-condition the entire house by making use of the present duct system and the furnace blower. Most

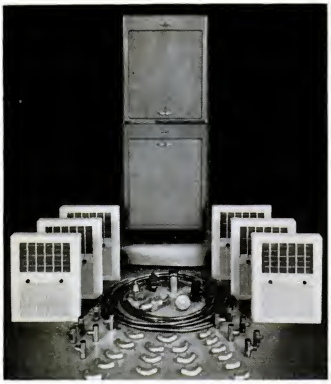
Westinghouse

Single-dial control, illuminated control panel and an electronic air cleaner are special features of this room-size air conditioner. Thermostat maintains the desired temperature and humidity of the air in the room. Air cleaner removes pollen, dust and smoke

In a walled patio located on the east, west or south sides of the house avoid use of light-colored flagstones, as these will reflect sun's heat into house. Same is true of walks and driveways near house walls

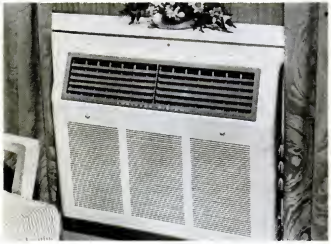
Carrier





Heatmaster

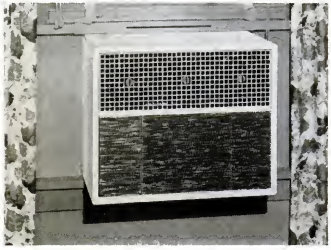
Complete home heating and cooling is provided for by this ready-to-install system which operates as a hot-water heating unit in cold weather and as a cooling system in summer. Water is chilled by cooling unit and circulated through individual recessed room units



Chrysler

Above, this room conditioner is completely flush with outside wall when installed. Extends only slightly beyond draperies on room side of wall. Below, although it can be installed in a window, this unit also is adapted to through-the-wall installation

General Electric

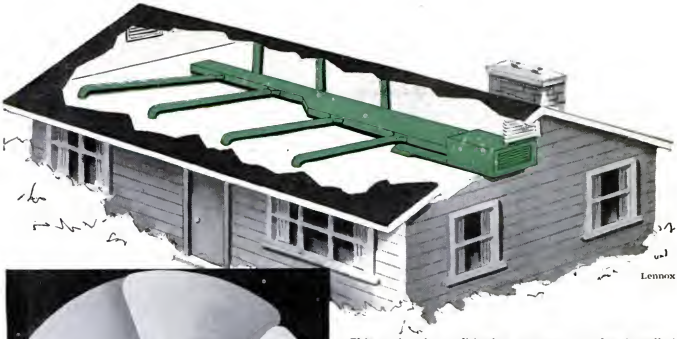


gravity heating systems can be adapted to a similar air-conditioning installation with the addition of a suitable blower. For those with hot-water or steam-heated homes, attic installation of an air-conditioning system with ducts is possible and at a reasonably economical figure. For those planning new homes there also is available a heating unit especially designed for addition of an air-conditioning unit at a later date. The cooling unit is simply installed in a compartment provided for it in the original heating unit.

Much can be done by the homeowner himself, both before and after installation of air-conditioning equipment, to lighten the work load on the unit. A new home should be located to take advantage of all available shade, windows and roof overhang should be planned to prevent entrance of direct rays of the summer sun and reflecting surfaces should be located so that they do not direct the heat of the sun into the house. Driveways, terraces, patios and walks on the south, east and west sides of the house should be of dark materials which do not reflect light and heat. Note details A to D inclusive on pages 160 and 161. A small shade tree can cut the cooling load appreciably even though it is effective during only a part of the long summer day. A large shade tree with heavy foliage is even more valuable, while a house that is completely shaded by large trees requires only about half as much cooling as will the same house standing in the open and unprotected.

Likewise wide overhangs, window awnings and blinds, wall, ceiling and attic insulation, light-colored roofs and sealed dual-paned sash are construction features which are a valuable help in reducing operating costs of all types of air conditioners. Open-sided awnings alone will keep out up to 50 percent of summer's heat. A light-colored roof can reflect up to 50 percent of the sun's heat. Proper insulation will account for about the same amount.

When planning a new home it's a good idea to locate the garage on the west end of the house as in detail A, page 160. In this position the garage serves as an effective heat barrier. Avoid a light-colored floor in a walled patio, detail C, page 161. Often an exposed window, particularly a large one, can be protected adequately from the summer-sun's rays with an adjustable louver as in details A and B, page 161. Also in new-home construction it is sometimes recommended that a kitchen-utility-bath grouping be worked into the floor plan as in detail D, page 161. This arrangement tends to confine heat and humidity-producing activities such as cooking, bathing and laundering to a comparatively small area



Lennox

This unit air-conditioning system can be installed in the attic. Provides rainproof air handling and two-stage cooling in a unit of minimum over-all size

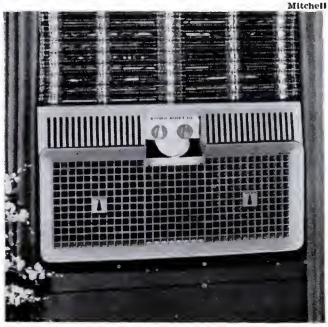
Axial fan with which attic unit is fitted accounts for its high efficiency, minimum space requirements and exceptionally quiet operation under all conditions

and reduces the load on the cooling unit.

In older homes where air-conditioning equipment is installed it is frequently recommended that storm sash be sealed, storm doors be weather-stripped and left on the year 'round, and that adequate insulation be added where necessary to shield against heat transmission from the attic and through walls. Awnings that effectively shade windows on the east, south and west sides of older homes will usually return the investment in savings on operating costs of an air-conditioning system. Light-colored exterior paint on walls and trim also contributes its reflective properties quite effectively. ★ ★ ★

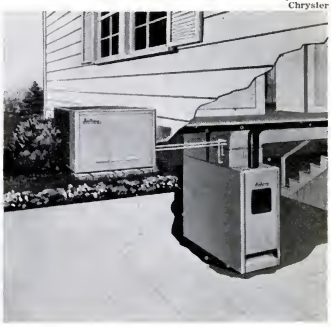
Designed to fit in a window only 27 in. wide this room conditioner features simple twin controls, a compact housing that fits nearly flush with draperies. Attractive grille is finished to harmonize with room

Mitchell



Space-saving central system is designed for year-round air conditioning with condensing unit placed outside in any convenient location. Uses same ductwork for cooling, heating. Cooling unit is in plenum

Chrysler



Cool Footpath on Beach Provided By Spray Hose

At a municipal beach, bathers previously tortured by walking barefoot a considerable distance across hot sand to the water's edge now have a delightful cool path. This service is provided by spraying a strip of beach with water by means of perforated flat spray hose. The water pressure is adjusted so the spray rises no higher than 2 ft. off the ground, which will dampen and cool an area of sand on either side of the hose, yet not reach the bather's jackets or shirts.

6-Volt Accessories Used With 12-Volt Systems

Adapt 6-volt automobile accessories to cars with 12-volt systems by attaching the positive lead to the center-cell connecting strap of the 12-volt battery. A large alligator clip soldered to the lead will do the trick.

Rack Under Rural Mailboxes Shelters Large Packages

The parcel rack attached to the underside of this rural mailbox stand affords protection against rain and snow for packages too large to insert in the box. Also, the wide, open front on the rack permits the mailman to deposit parcels easily, without the discomfort, loss of time and damage to packages that result when they are forced into a mailbox. The rack is made of 1 x 2-in. wood framework and is screened on three sides. It has a galvanized, sheet-metal roof and a hardboard floor.

"Wagon Wheel" Gate

Steel wheels from obsolete farm implements welded in a frame of steel angles from a dismantled windmill tower comprise this quaint and original farm gate

Needle Files Stored In Toothbrush Case

Force strips of corrugated cardboard, cut parallel with the corrugation, into the bottom half of an empty toothbrush case. You now have a handy container, with separate pockets, for carrying needle files.

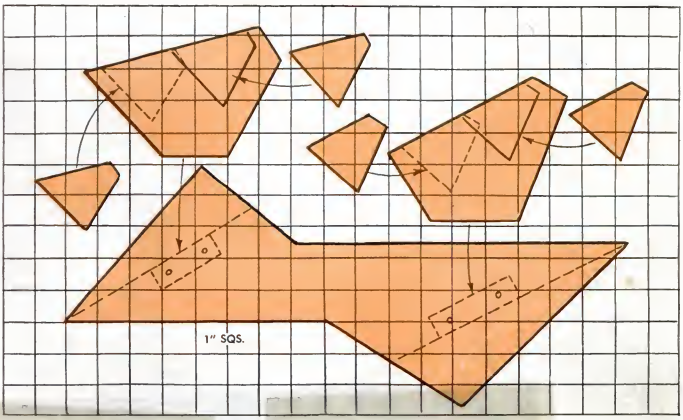
MODERN CANDLESTICK HOLDERS

THESE DISTINCTIVELY different candleholders follow the modern trend toward irregular shapes in three dimensions. The basic material is a 2-ft. length of 1 x 8-in. wood stock. Paper templates made according to the specifications below are used to lay out the individual pieces. For best appearance, the grain should run lengthwise in the base and be slanted up toward the back in the holders. The four triangular-shaped pieces which will be attached to the larger uprights can be cut from the scrap strips left from cutting out the base. The grain on these pieces should correspond with that of the uprights so that glued joints will be inconspicuous. Sand all parts thoroughly, giving particular attention to surfaces of joints to be glued. Then glue the holders together, clamping them firmly until dry. Meanwhile, drill the base for the wood screws that will fasten the holders to it, countersinking each hole from the bottom. Drill matching holes of smaller diameter in the holders and attach them to the base. Next, drill the holes for the candles to a depth of ¾ in. and bevel the sides of each hole to fit the bottom taper of the candles.

Nicholas M. Margetis, Madison, Wis.

A small potted ivy or a spray of pine boughs placed between the holders adds contrast to the sharp lines

Offsetting one of the holders so that the two are not parallel to each other helps promote the irregular motif. The lines of the holders should not match



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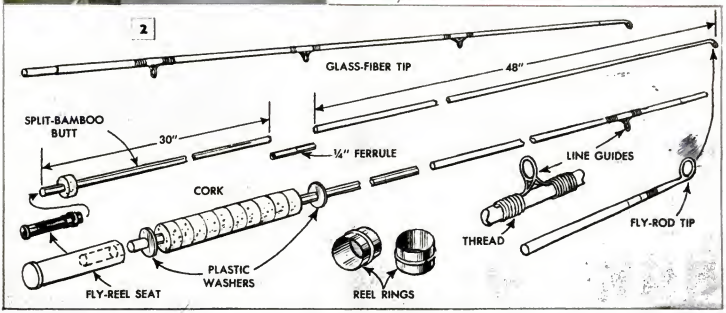


"TAILOR MADE" CASTING ROD

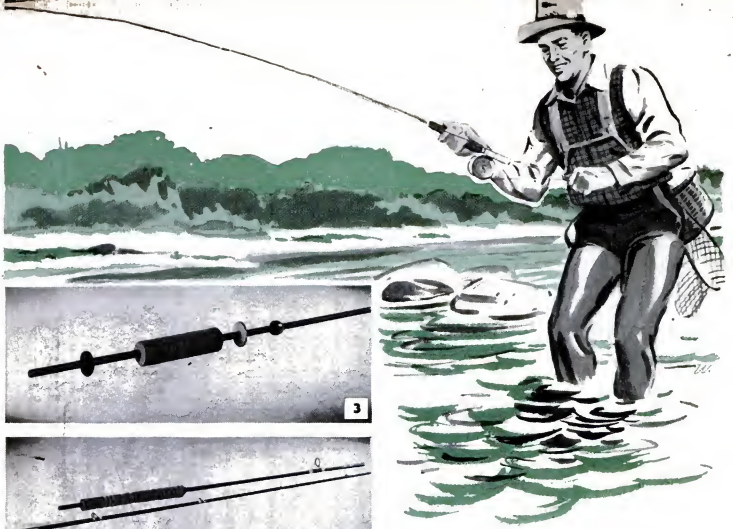
By Joe Ott

CONTROLLED flexibility is the added advantage I now include in the design of tailor-made casting rods made for my own use. The secret is to use a combination of a bamboo butt and a glass-fiber tip. Weight and length of the bamboo determine the weight and balance of the rod, the glass fiber controls flexibility. If more spring is desired, the bamboo butt is shortened and the glass-fiber tip is made longer in relation to the over-all length of the rod. Reversing the ratio will proportionately stiffen the rod.

Parts for assembling the rod are shown in Figs. 2 and 7, and are available at the shops of custom-rod makers and some sports stores. As with any custom-made rod, type and number of fittings are left to the discretion of the individual. Lengths given for the glass-fiber and bamboo sections of the rod are only suggested and can be changed to suit. Remember that the top end of the butt and lower end of the tip must fit in the same size ferrule. Average handle length is about 11 in., requiring 22 cork rings ½ in. thick.

Assemble the rings on the bamboo butt, attach all line guides, ferrules and fittings with masking tape, Figs. 3 and 4, and tape on a reel. Check the rod now for flexibility and balance and shorten the bamboo or glass-fiber sections to suit your personal requirements. Keep in mind that the finished length of the rod should be somewhere between 6 and 7 ft. The rod will be long enough for a fly rod and light enough for a spinning outfit. If a fly-reel seat is to be used, glue the end of the butt in a length of dowel drilled to receive it. The dowel can be turned or filed down to provide a snug fit for the reel seat. Drive a 1/16-in. rustproof-metal pin through the seat, dowel and into the bamboo.

When making the handle, glue on all but two of the cork rings. Turn the handle to size and shape so the reel rings fit snugly on the center portion but cannot slip off the end. Slip on the rings, then glue on



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the last two corks. Shape them so the rings cannot slip off that end of the handle. The handle can be reinforced at its forward end with a bell-shaped winding check. File a flat on the handle for a spinning-reel seat and the handle should now appear as in Fig. 5 or 6, depending on the type of rod.

If a fly-reel seat is not used, a butt plate is screwed to the end of the handle. To prevent the butt from splitting when the butt-plate screw is driven into it, the bamboo is wrapped with thread, then wiped with glue. Two contrasting colors of thread are used to bind the guides, ferrules and winding check with a rod winder, Fig. 1. If the guides have thick bases, file them to a slight taper. Attach the guides to the rod with masking tape, then wind tape on the rod at each end, so it can be filed down, continuing taper of guide base. ★ ★ ★

7

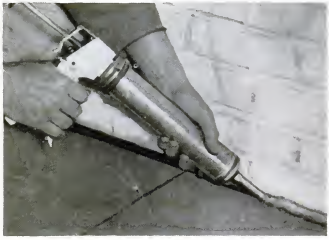
Arrows Held by Ground Quiver Bent From Wire Coat Hanger

A handy ground quiver that will hold a dozen arrows in an upright position within easy reach of an archer can be made from a wire coat hanger. After straightening out the coat hanger, form a loop about 6 in. in dia. at one end of the wire and bend it at right angles as shown. In use, the quiver is merely stuck into the ground.

R. M. Woodbury, Natick, Mass.

Calking Compound Seals Cracks Where Sidewalk Joins Wall

A sidewalk laid directly against a masonry wall will tilt toward the wall after a few years of exposure to water and the effects of ant excavation unless the joint between the two constructions is kept tightly sealed. To prevent this damage the joint should be sealed with calking compound, which will remain flexible enough to allow movement due to frost heaving and expansion and contraction. Before applying the compound, debris must be removed from the joint to a depth of 1 in. When the joint is dry, oakum is tamped in to ¼ in. below the surface of the walk, followed by a layer of calking compound which is allowed to project slightly above the surface. It is important that the crack between the walk and foundation be dust-free for a good seal.



Electrified Kerosene Lanterns Provide Rustic Yard Lights

To provide his front yard with lights to match rustic fencing, one homeowner installed electrified kerosene lanterns on pipe posts on either side of the gate. The lanterns are electrified by installing sockets and running outdoor-type cable down through the posts and underground to a fused outlet inside the house.

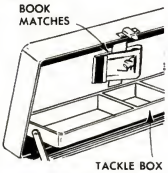
Lena Anken Sexton, Inkom, Idaho.

Chair "Pontoons" Protect Lawn

The legs of a lawn chair will not sink into the ground, leaving unsightly holes, if you place two narrow boards under the legs like runners. Placed flat on the ground, the boards serve as pads. The manner of attaching them to the legs depends upon the type of chair. Scrap lumber from packing boxes may be used for this purpose. After the boards are attached, they may be painted to match the color of the chair.

Blanche Campbell, Los Angeles, Calif.

Matches Taped in Tackle Box Kept Dry for Emergency



A ready supply of dry matches is kept on hand when on a camping or fishing trip if a book of matches is taped on the inside of your tackle-box lid. Only the back of the match cover need be fastened, permitting use of the matches without having to remove the tape. Since the cover is held firmly in place it is easy to strike a match with one hand while holding a fishing rod with the other.

WTM 58

DECORATE WITH WHEELS

Single wagon wheel adds to rustic appearance of lantern and mailbox on post located at side of highway

Light-colored wheels contrast well with darker tone of stockade-type fence made from rough-cut wood

Above, wheel forms simple and attractive support for mailbox that is attached directly to steel tire. Below, wheels form strong and unusual fence that achieves open effect often lacking in other types of fencing

Above, heavy-spoked artillery wheels have heavy appearance that blends with massive brick wall. Below, strong and symmetrical, wagon wheels add a definitely handsome look to these driveway gates

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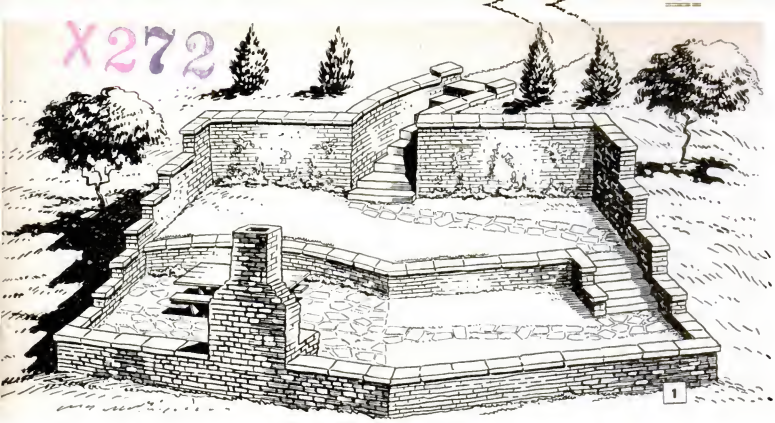
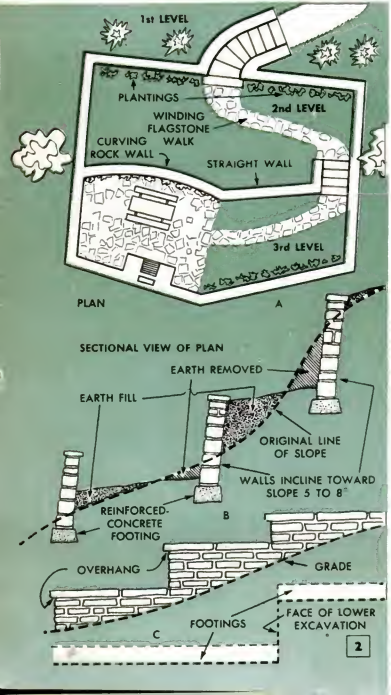


When you're planning a recreational area on a sloping lot it's quite natural to think of flagstone walks and walls of stone. Project pictured above is especially adapted to a fairly steep downward slope

PATIOS



BUILDING A PATIO or outdoor recreational area on level ground is a comparatively simple procedure, and you have a variety of materials and plans from which to choose. But if your lot slopes away from a point near the back door, either up or down, the prospects of achieving something both attractive and useful can appear less hopeful. However, there are materials and plans that belong. As an example, there's a lot of easy informality and beauty in stone and stonework is a natural on a slope.

If your lot slopes down rather steeply, then a two or three-level recreational area, Fig. 1, may be the solution. A plan view of this area is shown in detail A, Fig. 2. Fig. 3 pictures a similar project in process of construction. A variation is shown in Figs. 7 and 10, this design being suitable for a lot that slopes either up or down. In both designs the walls are not only ornamental features, they also serve as retaining walls to hold earth in place until grass and shrubs are well established.

Details B and C in Fig. 2 suggest ways of planning such a project. Both are somewhat exaggerated for purposes of illustration and are intended only to show in a general way how to proceed. First, have the plan of the project clearly in mind, know precisely where your lot lines are and whether or not local codes require a permit. Lay out the location of the walls, the plan including one curved wall, or section of wall. Then excavate for the foot-

3

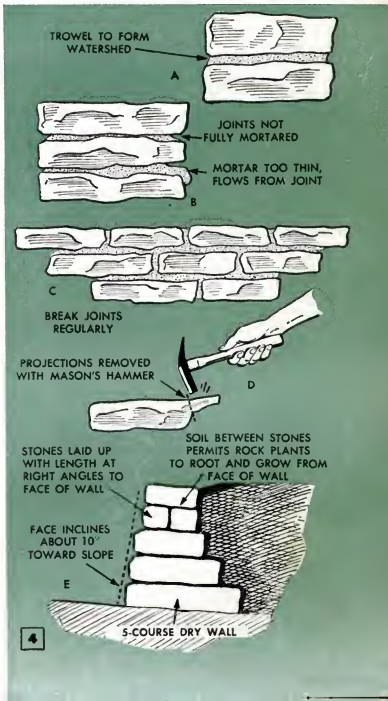
Photos by Sakrete

on SLOPING LOTS

By W. Clyde Lammey

ings and square up earth shoulders against which the walls will be laid, Fig. 11. Usually it's best to begin this job at the high side of the slope and work down, shoveling a part of the excavated earth onto the slope above, detail E, Fig. 5. Ordinarily, it's good practice to carry the side walls up the slope in a series of steps, excavations for the footings being made as in detail C, Fig. 2. Of course, special conditions may require somewhat different procedures than those outlined. If the slope is moderately steep, requiring walls 4 to 6 ft. in height at some points, all stonework should be mortared. Low walls not subject to appreciable pressure from above can be laid up dry (without mortar) as in detail E, Fig. 4. However, this is not good practice on single-course walls much above 3 ft. in height. Another procedure which is permissible on low walls laid up with mortar is leaving open joints, or voids, detail B, Fig. 5, the purpose being to encourage the growth of rock plants. However, the best construction requires that all joints be mortared.

Time was when mortar had to be mixed from separate ingredients at the job site. Now you can purchase it ready-mixed in sacks. Just empty the dry contents of the sack onto a platform of boards, or into a shallow, watertight box, add water according to instructions on the container, mix and it's ready to use, Fig. 8. This dry, premixed product makes a smooth, cement mortar of just the right plasticity.



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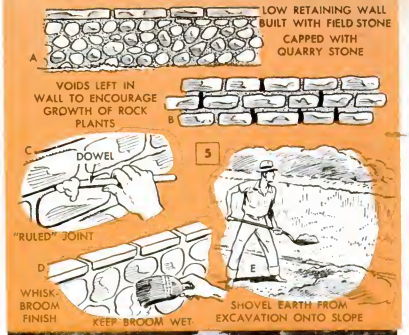
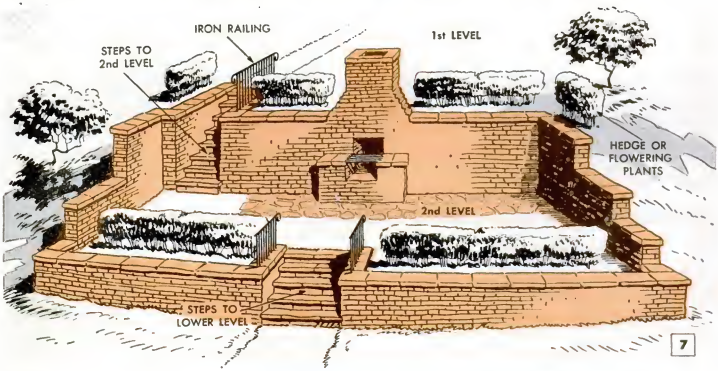


Recreational area below is designed to be adapted to a lot that slopes either up or down in relation to the house. When built against slope one stairway is omitted. Use natural stone

The tricks in laying up neat and durable walls of stone are not difficult to master, but the procedure requires careful attention to details. Stones of a more or less regular size generally are easiest to handle and lay, details A and C, Fig. 4, but appearance-wise many will prefer uncut stone and field stone, Figs. 3 and 6 and detail A, Fig. 5. Due to the irregularity of shape, the latter two types usually require more time in bedding, also a greater quantity of mortar. Ordinarily the mortar mix should be slightly stiffer when laying uncoursed walls of field stone. When laying up walls with any type of stones avoid skimping on the amount of mortar used in bedding each individual stone, detail B, Fig. 4. Projections that interfere with proper bedding often can be broken off with a hammer as in detail D, Fig. 4. To prevent large stones from forcing the mortar out of the joints, bed them on small stones which will support each stone and give a mortar joint of the proper thickness.

When laying up a stone wall against an earth face, or shoulder, avoid the representative faults indicated in detail A, Fig. 9. Fill all voids with mortar, or mortar and rubble (small stones), as you go along, detail B, Fig. 9. Some masons prefer to build the wall a few inches from the earth face, detail B. The back face of the wall is then coated with mortar (back-



plastered) as it is laid up, thus presenting a smooth surface to the earth fill. However, in the type of wall construction pictured this is not always considered necessary.

In details C and D, Fig. 5, two methods of finishing, or "striking," mortared joints are shown. In stonework having more or less regular joints, detail C, Fig. 5, it is possible to obtain a rather attractive effect by raking the mortar lightly with a short length of ¾-in. dowel having one end rounded, the procedure producing what is sometimes referred to as a "ruled" joint. The second method, more commonly used to finish walls built with field stone, is shown in detail D, Fig. 5. These methods are not considered orthodox by all stonemasons, but they are simpler for those with less experience to carry out. In either case the job must be done before the mortar sets. The first, detail C, Fig. 5, should be done while the mortar is still soft, but the latter step, detail D, should not be attempted until the mortar has stiffened (set) slightly.

When building steps you have the choice of pouring concrete in wooden forms or laying up with individual stones, Figs. 6, 7 and 8. Use of step-sized stones is perhaps easiest as no forms are required. Single step-sized stones should be supported on smaller stones or bricks, Fig. 8, and the joints mortared. ★ ★ ★

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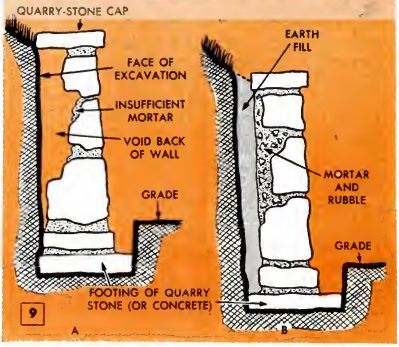
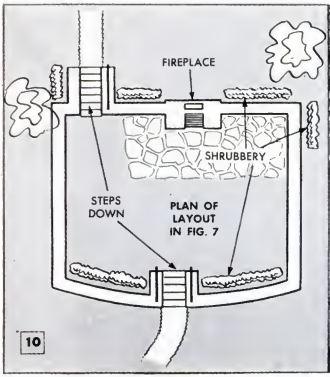


9

First step usually is to square earth shoulder against which wall is laid. Next is to excavate for stone or concrete footings



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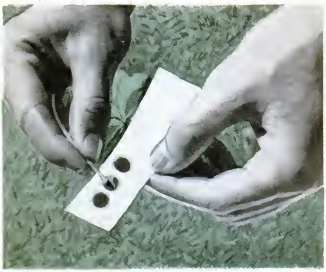


1. Test for potassium requires that a drop of sap from freshly cut plant stem be placed on each of three orange-colored spots on test strip. After about a minute, wet each spot with developer

2. Squeeze one drop of the plant sap onto the center of the blank area of the test strip, to be used for testing the plant's phosphorus content. Do not make test for phosphorus, but go on to nitrogen test

3. To make nitrogen test, use toothpick to dip out tiny bit of nitrate powder from plastic vial in testing kit. Spread powder around an area near the end of the test strip as indicated in photograph above

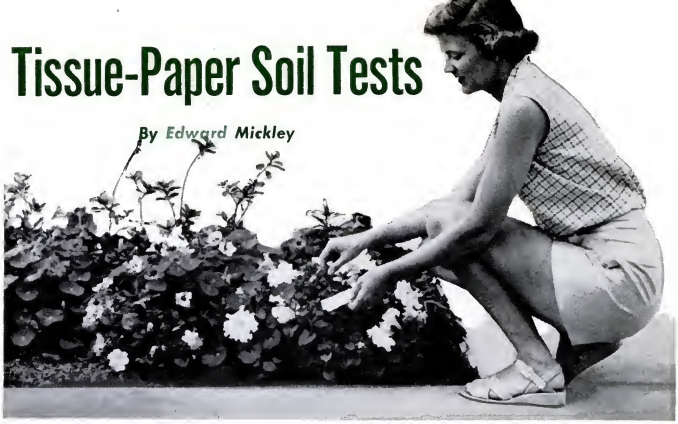
4. Wrap powder and paper around freshly cut plant stem as above, and press firmly to wet powder with plant sap. Powder will turn healthy pink if sufficient nitrogen is present. Lighter pink indicates lack

5. For phosphorus-content test, place one or two drops of developing fluid over plant sap which you squeezed onto blank area of test strip. Make sure developer thoroughly moistens all of sap

6. As soon as spot of sap is moistened, press metal strip against it for about 10 sec. If spot turns dark blue, it indicates plant is absorbing enough phosphorus. A lighter color shows lack of mineral

Tissue-Paper Soil Tests

By Edward Mickley



HAVE YOU EVER HAD disappointing results with a garden, even though you applied plant foods and minerals that soil tests indicated were in short supply? One of the reasons for this is that plants of different types vary in their need for certain plant foods. Lawn grasses, for example, need much more nitrogen than they do phosphorus or potassium. On the other hand, roses and other large flowering shrubs require quantities of phosphorus and potassium and only small amounts of nitrogen.

With a testing kit now available, it is possible to determine what minerals should be added to the soil by directly testing the plants. The kit consists of chemically treated strips of tissue paper, nitrate powder, a metal strip and developing fluid which is prepared by filling a dropper bottle in the kit with water.

To test a plant, hold one of the tissue strips with the orange-colored spots facing up, and squeeze a drop of sap from a freshly cut plant stem onto each of the spots, Fig. 1. Squeeze another drop of sap onto the center of the blank area of the tissue strip, Fig. 2.

Testing for Nitrogen

With a toothpick, dip out a tiny bit of nitrate powder and spread it around near the blank end of the tissue strip, Fig. 3. Then fold the paper and powder over a cut plant stem, Fig. 4, pressing firmly to make sure the sap thoroughly wets the nitrate powder. Now open the paper and examine the color of the powder. If it is still white or only a light pink, the plant being tested is starved from lack of nitrogen. A healthy pink color shows the plant is receiving the correct amount of nitrogen, dark pink, or a reddish color indicates that the plant is absorbing too much. An excess of nitrogen often causes a lush growth that encourages fungus growths and other plant diseases.

Testing for Phosphorus

Wet the spot of sap squeezed onto the blank area of the paper strip with one or two drops of developing liquid, Fig. 5, and immediately press the metal strip from the kit onto the moistened spot and hold it there for about 10 sec., Fig. 6. The spot will turn a dark-blue color if the plant is receiving enough phosphorus. Lack of the mineral shows as a light-blue color; the lighter the blue, the less the phosphorus.

Testing for Potassium

When the sap from a plant stem has been on the three orange-colored spots for at least a minute, wet each spot with a drop of developer. If there is sufficient potassium in the plant sap, the spots will remain orange-colored. When all the spots turn yellow, only the barest minimum of potassium is being absorbed by the plant.

The spot at the end of the strip is most sensitive and will stay orange when the sap contains only about 1000 parts per million (p.p.m.) of potassium. The second spot stays orange when there are 2000 p.p.m. and the third spot stays orange when there are at least 3000 p.p.m. Speckling of the color on any of the spots indicates there is less potassium in the sap than is needed to keep the spot completely orange. If only the end spot stays orange, most plants need additional potassium for good growth. ★★★

Envelope Moistener Made From Can and Broom Handle

This handy device for sealing envelopes (left) can be made from a square typewriter-ribbon can, a length of broom handle or dowel for a roller and two nails. After the broom handle has been cut the right length, drive a small nail in each end for a shaft. File a notch in two sides of the can as shown in the detail and install the roller assembly. A sardine can may be used in place of a typewriter-ribbon can, if the latter is not available.—Domingo Ferrer Gonzalez, Remedios, Cuba.

Toothpicks Locate Seedlings

Toothpicks placed beside each seedling in a window box or flower garden will aid in weeding and cultivating so that the slow-growing ones are not pulled out by mistake. Since the characteristics of a seedling vary from the time it breaks the surface until the features of the growing plant are evident it is best to observe the germination cycle so that the seedlings can be distinguished when they do appear.

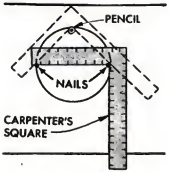
Cork Scours Knife Blade

Replacing the generally used cloth with a large cork when scouring the blades of sharp-edged knives will minimize chances of cut fingers. Also, the dampened cork permits applying firm pressure over a fairly large area, assuring a quicker and better job of cleaning than is possible with a cloth.

Chicken-Wire Flower Frogs

One housewife makes her own flower frogs from discarded chicken wire, which is cut and bent to fit each container. The large mesh accommodates flower stems with greater ease than standard frogs. To permit better positioning of flowers, a frog can be placed an inch off the bottom of the container in addition to the one at the top.

Carpenter's Square Used As Improvised Dividers

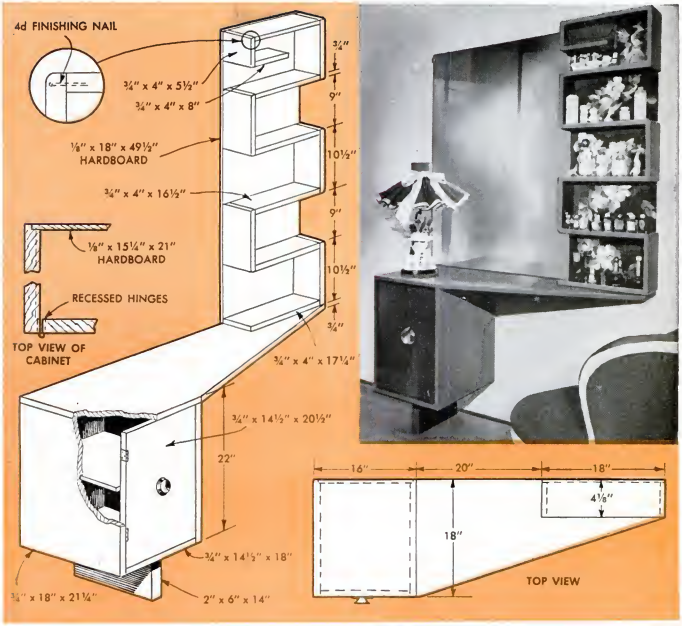


When a pair of dividers is too small for a particular job, a carpenter's square will serve as a substitute instrument. Drive two nails to form the diameter of the circle and with a pencil held in the corner of the square, slide it around the nails with the inside of the blade always touching both nails. One half of the circle is scribed with each swing of the square around the nails.

Ted Otsu, Vancouver, B. C., Can.

Modern Furniture WTM 58

NOVEL DRESSING TABLE



DEFINITELY INTERESTING and unusual in design, this dressing table has the added appeal of requiring only hand tools for its construction. The table top is cut out first and can be hardwood or hardwood-faced plywood. Strips of hardwood veneer or Wood Tape glued to the edge of the plywood will produce the effect of solid lumber. Fir plywood covered with wood-grained plastic laminate also may be used.

Finishing nails are used to assemble the shelves, which are glued and nailed to a piece of ⅛-in. hardboard cut to the dimensions given. All nails are countersunk and covered with wood putty to provide a smooth appearance. As indicated in the detail, the corners of the shelves are rounded and sanded smooth. Hardboard is sufficient to support the shelves, since the assembled dressing table is screwed directly to the wall. Locate wall studs by tapping on the plaster, then use screws that are long enough to pass through the plaster and drive into the studs. Support the top of the table on a strip screwed to the wall and drive screws through the hardboard back of the shelf assembly directly into the wall.

The safelike cabinet under the table is made from the same stock as the top. Its hardboard back may be rabbeted into the sides if power tools are available, or nailed to blocks recessed ⅛ in. inside the cabinet. Grooves can be cut in the cabinet sides to support the shelf or, alternatively, the shelf simply can be nailed, with the nail-heads countersunk and covered with putty. Hinges on the cabinet door are recessed as indicated for a more finished appearance. The knob on the door can be metal or wood. Color should harmonize with room decor.

A mirror smaller than the one shown can be used, but it should be fitted in a frame that fills the space between top and shelves.

Hi Sibley, Nuevo. Calif.

Photos by Don Hontek

This little 6 x 8-ft. prefab, designed by The Masonite Corp., makes an exciting dream home for tiny tenants

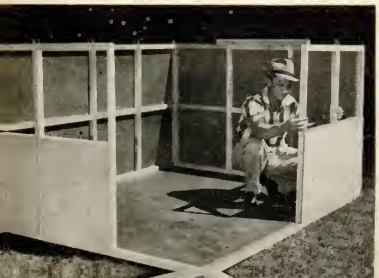
TAKE-APART PLAYHOUSE

Comes apart in easy-to-handle sections so it can be set up indoors during winter for year-round play. Made of durable hardboard, it takes paint beautifully

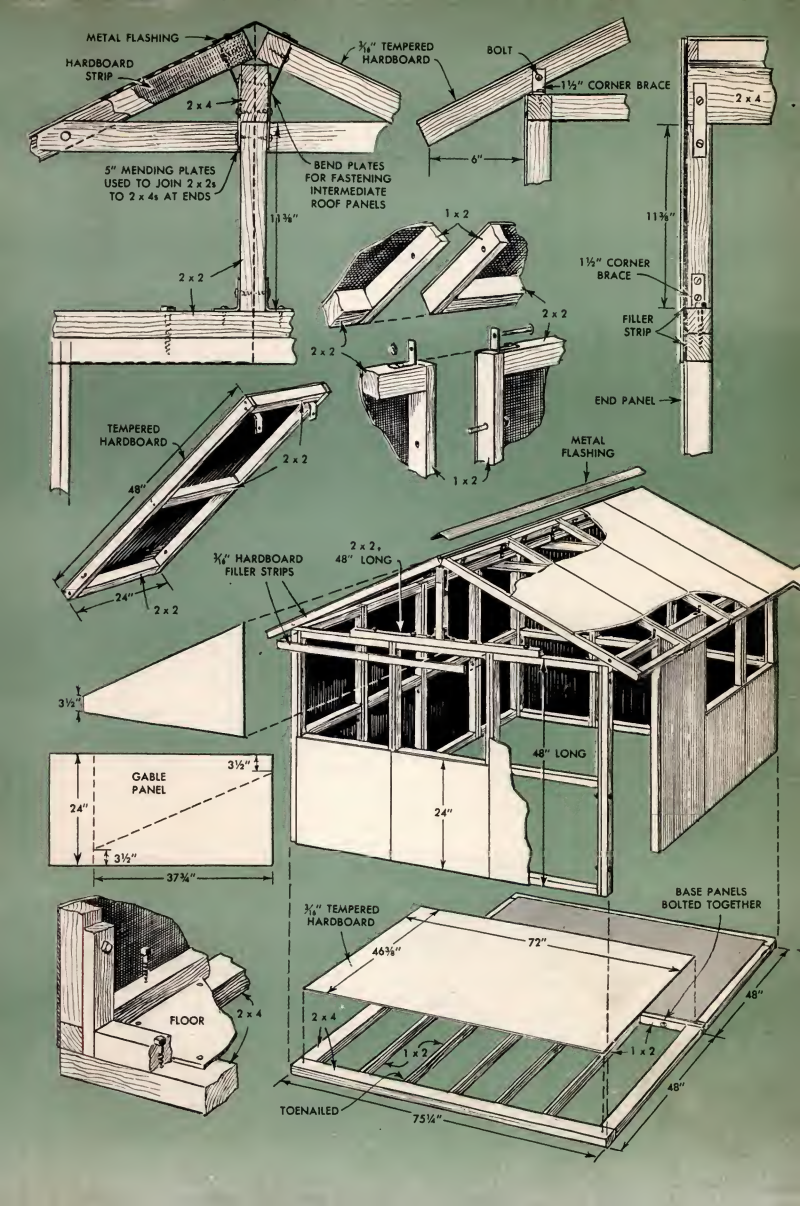
A PLAYHOUSE is far from an inexpensive toy, but when it is designed for year-round play, it becomes less of a luxury when you consider the additional hours of fun it will afford your youngsters compared to other seasonal toys.

While it is true that a lot of basements will not permit setting up the house in its entirety, its take-apart feature makes it possible to erect a smaller version of the house where space is limited. The walls and roof panels are interchangeable like the parts of a construction toy so that just half the house can be set up for indoor play. Basement headroom will be of no concern in most cases as the total height

Modular panels make erection simple. Intermediate panels are interchangeable to vary window location



One lag screw anchors each panel to floor; two ¼ x 2½-in. carriage bolts fasten panel to panel


METAL FLASHING
HARDBOARD STRIP
2 x 4
5" MENDING PLATES USED TO JOIN 2 x 2s TO 2 x 4s AT ENDS
BEND PLATES FOR FASTENING INTERMEDIATE ROOF PANELS
11⅜"
2 x 2
3/16" TEMPERED HARDBOARD
BOLT
1½" CORNER BRACE
6"
2 x 4
11⅜"
1½" CORNER BRACE
FILLER STRIP
END PANEL
1 x 2
2 x 2
2 x 2
1 x 2
TEMPERED HARDBOARD
48"
2 x 2
24"
2 x 2
METAL FLASHING
3/16" HARDBOARD FILLER STRIPS
2 x 2, 48" LONG
3½"
48" LONG
24"
GABLE PANEL
3½"
24"
3½"
37¾"
BASE PANELS BOLTED TOGETHER
3/16" TEMPERED HARDBOARD
46⅜"
72"
48"
FLOOR
2 x 4
2 x 4
1 x 2
1 x 2
48"
TOENAILED
75¼"

Ridge board is supported at each end by 2 x 2 posts which are fastened to walls with metal angle brackets

Above, two 1 x 2 members are used to tie each side of the roof together after the panels are all in place. Below, individual roof panels are attached to the ridge board with screws and mending plates, the plates being bent

of the house is a little more than 6 ft. Window and door openings can be rearranged, and screens and movable sash, as well as a door, may be added.

Framework of Stock Lumber

Except for the two floor panels which measure 4 x 6 ft., all others are made 2 x 4 ft. Counting the door panel, which really isn't a panel but rather a three-sided frame, you'll need 14 wall panels, including 4 corner panels, and 8 roof panels. The corner panels differ from the others in that a 2 x 2 is used along one side instead of a 1 x 2. Other than this, all panels are assembled exactly alike, using 2 x 2s for the cross members and 1 x 2s for the side members. These are nailed together to form simple frames which are covered on the outside with 3/16-in. tempered hardboard. Four of the panels are made half panels to provide window openings.

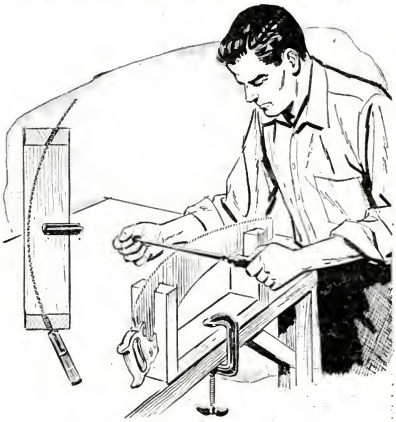
The two frames for the floor panels are assembled from 2 x 4s and 1 x 2s, the latter being set on edge and the 2 x 4s placed flatwise. The top sides are floored with hardboard. By ripping 1⅝ in. from the long side of two 4 x 6-ft. sheets, the hardboard will be just the right size to leave a 1⅝-in. border around the four sides.

Panels Bolted Together

Pick a level spot of ground to place the floor after bolting the panels together from the underside. Start erecting the walls by fitting a corner panel first. As with all panels, a single lag screw in the center of the bottom rail is used to fasten the corner panel in place. Two bolts are used, one at top and bottom, to join each panel to the succeeding one. After the walls are erected, a 2 x 2 stiffening member, 48 in. long, is lag-screwed to the top of the end walls, bridging the center panels. This member supports the 2 x 2 posts that in turn support the 2 x 4 ridge board to which the roof panels are fastened with mending plates. Angle brackets anchor the roof panels to the walls. Each gable end of the house is faced with two hardboard panels cut from a 2 x 4-ft. sheet. To make these overhang the covering on the wall panels and provide a drip edge, narrow filler strips of the material are first nailed to the outside edges of the end roof panels, the posts and the stiffening members. The gable panels are fastened with roundheaded screws. Finally, the ridge is covered with a sheet-metal flashing, and 1 x 2 braces are installed on the inside of the house to join both halves of the roof. ★ ★ ★

Improvised Vise Holds Handsaw for Sharpening and Setting

In the absence of a saw-filing vise, a substitute can be improvised from three short lengths of 2 x 4s, spiked together as illustrated. Vertical slots are cut in each upright and at opposite angles so that the saw, when inserted in them, will be bowed to approximately the degree indicated in the detail. Bowing of the blade holds it securely in the slots of the vise. Addition of a third upright at the center of the vise will help dampen noise and vibration when filing.

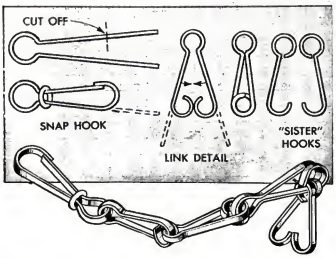


Cleaning Gilded Frames

A weak solution of ammonia and water will clean gilded picture frames. First dust the frame, and then go over it with a clean cloth dampened in the ammonia solution. If exceptionally dirty, allow the frame to stand for about 10 min. and then go over it again. Dry by blotting with a soft cloth.

Light Chains and Snap Hooks Improvised From Cotter Pins

It is easy to make light chains, snap hooks and "sister" hooks from cotter pins, using pliers to cut the pins bend the ends and link them together, as shown in the drawing below. Select a size of cotter pin best suited for the purpose.



Black Piano Keys Make Modern Door Pulls

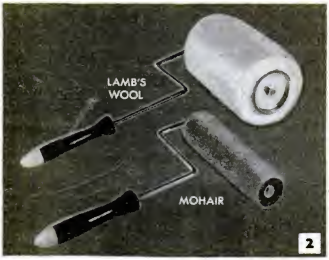
Prefinished ebony pulls for cabinet or closet doors can be made from the black keys on an old piano and attached with glue and wood screws. A thin knife edge inserted between the key and its wood base usually snaps it free. Sanding removes any wood fibers that cling to the bottom.

Pick a Flattering Awning!

Like selecting the right hat, just any old awning or canopy should not be hung on your house. They should harmonize and become a part of its particular style. A six-page feature in the July issue gives helpful pointers on choosing the right awning. Also shows the handy homeowner how to make his own, using glass fiber, wood or metal

SN 58

Although it cannot be used for applying rubber or water-base paints, lamb's wool does an excellent job of applying oil-base paints on irregular surfaces such as woven-wire fencing, as shown above



Mohair, above, is ideal for applying enamels. Its short nap holds less paint, flows enamels better. Long-nap lonel, below, is excellent for use on masonry. Pronel is used on fairly smooth surfaces

USE THE RIGHT PAINT ROLLER

By Jay W. Hedden

IF YOU WANT to do a good paint job with a roller, don't use just any cover on the roller. Modern paints require covers especially designed for their applications, as do the various painted surfaces. For example, wool, which was the first practical material used for the covers of paint rollers, absorbs moisture from water-base paints and causes the fibers to lose their resiliency and paint-holding qualities. To overcome these problems, the EZ Paintr Corporation, in conjunction with fabric and chemical companies, developed synthetic fabrics which do not have the disadvantages of the natural fibers.

Long-nap lonel, Fig. 3, is a densely woven synthetic material that is used for applying paint to masonry and other rough surfaces. Its long fibers are abrasion-resistant and force paint into the many irregularities of this type surface. Applying most types of paint to smooth or semismooth surfaces is done well by pronel, Fig. 3. Its fibers do not break or "finger" and cause an undesired mottled effect.

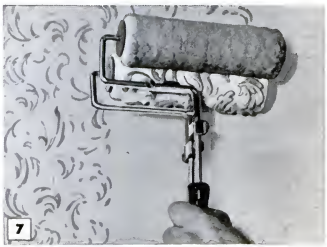
Lamb's wool, Fig. 2, still has definite advantages for some types of applications with oil-base paints. As an example, painting woven-wire fences, Fig. 1, is done quickly and efficiently with wool.

Mohair, Fig. 2, is a short-nap fabric that is excellent for applying enamels and rubber-base paints to smooth surfaces. Because its short fibers hold less paint than other types, it flows enamels better and reduces "orange peel" to a minimum.

Short-nap lonel, Fig. 4, is comparable to pronel in the quality of the finish it produces. Dacron, shown in Fig. 4, is used for application of exterior paints on wood siding. Carpet, Fig. 4, is used for obtaining a stipple effect with oil-base paints. A stippling effect also is obtained with frieze, Fig. 5, which is used to apply texture paints on dry-wall construction to produce a semirough plaster appearance.

Figs. 6 and 7 show a specialized roller used for "printing" a pattern on a painted surface. The roller attachment is clamped to the handle of a regular roller, which, when dipped in paint, rolls paint onto the printing roller. A hand stamp is used to finish the pattern in areas not reached by the roller. ★ ★ ★

Special roller, above, is attached to regular roller to make "printed" pattern on painted surfaces. Below, paint from regular roller then is rolled against printing roller which transfers it to painted surface



PAINT-ROLLER GUIDE

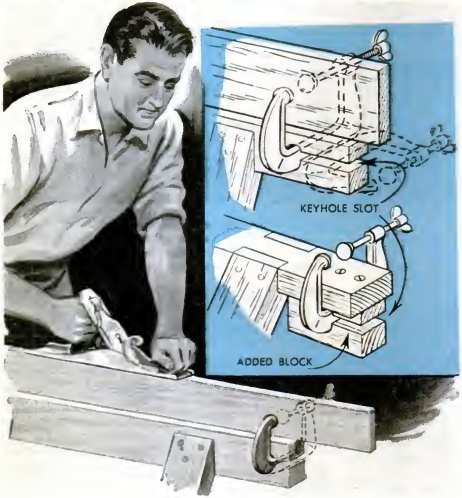
INTERIOR FINISHING (Covers are listed in order of preference)

	Alkyd Resin Flat	Latex Rubber-Base Flat	Interior Wall Primer	Flat Oil Base	Enamel, Gloss and Semigloss	Enamel, Flat or Satin Finish	Rubber-Base Texture Paints	Water-Base and Emulsion-Type Paints	Shellac or Stain	All Aluminum Paints
Sand Finish Plaster and Dry Wall	Pronel Lonel Mohair	Pronel Lonel Mohair	Pronel Lonel Mohair	Pronel Lonel Mohair	Mohair Pronel Lonel	Pronel Lonel Mohair	Frieze Carpet	Pronel Lonel		
Putty Coat or Smooth Plaster	Pronel Lonel Mohair	Mohair Pronel Lonel	Pronel Lonel Mohair	Pronel Lonel Mohair	Mohair Pronel Lonel	Mohair Pronel Lonel	Frieze Carpet	Mohair Pronel Lonel		
Light Spanish Plaster	Pronel Lonel	Pronel Lonel	Pronel Lonel	Pronel Lonel	Pronel Lonel	Pronel Lonel		Pronel Lonel		
Heavy Spanish Plaster	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel		Long nap Lonel		
Acoustical Surfaces								Pronel Lonel		
Woodwork	Mohair Pronel Lonel			Mohair Pronel Lonel	Mohair Pronel Lonel	Mohair Pronel Lonel			Mohair Dacron	Pronel Lonel Dacron
Stippling Surfaces	Carpet Frieze			Carpet Frieze			Frieze Carpet	Sponge Frieze		

EXTERIOR FINISHING (Covers are listed in order of preference)

	Bonding, Cement Paints	Exterior Latex Base	Exterior PVA (Polyvinyl Acetate)	House paints (Over Primer)	Exterior Trim Enamels (Over Primer)	Waterproofing, Clears	Exterior Varnishes	Stain	Aluminum Paints
Light Stucco Smooth Concrete	Pronel Lonel	Pronel Lonel	Pronel Lonel	Pronel Lonel	Pronel Lonel	Pronel Lonel			
Heavy Stucco Rough Masonry	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel			
Brick	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel	Long nap Lonel			
Wood Siding				Dacron Pronel	Dacron Pronel		Mohair Dacron	Mohair Dacron	Pronel Dacron
Asbestos Siding		Pronel Lonel	Pronel Lonel	Dacron	Dacron Pronel				

Long Boards To Be Edge-Planed Held on Sawhorse With C-Clamp



Edge-planing of long boards is easier when they are held vertically with a C-clamp fitted in a keyhole slot at the end of a sawhorse. Where the top member is thick enough in height the slot is made directly in it, otherwise a small block is screwed to the bottom side for the purpose. A hole is bored and saw cuts made to form the keyhole, the exact size being determined by the dimensions of the C-clamp used. The clamp is held in a horizontal position to slip it into the slot, and is then turned vertically to hold the work. Widths of the slot and hole must be square with the width of top surface of the horse so that the work will be held flush against this surface. Leather or rubber disks on the clamp jaws prevent marring the work.

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Features of Expensive Homes are included: built-in furniture, unusual amount of closet space, adaptability to various interior arrangements, and materials designed especially for amateur builders. The book is $2.50 and a complete set of 10 blueprints $12.50 (a duplicate set is $5.00). You can place a C.O.D. order or mail your remittance in full.

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WTM 58

LEAF DESIGNS
Reproduced on Paper

THE INTERESTING patterns of leaves can be permanently reproduced on paper using screen-process poster ink. These unique printed designs are perfect for decorative purposes and make possible a much neater report for school or scouting credit. First, place a small daub of ink on a piece of glass and work it out evenly with a rubber photoprint roller. Then, spread a sheet of newspaper on a table, lay a leaf face-down on the paper, and apply ink to the leaf with the roller. Invert the leaf on a sheet of absorbent paper, such as heavy art paper, cover it with a clean sheet of newspaper, and roll the area covered by the leaf. When the leaf is peeled off it will leave a printed reproduction of its design.

Don Honick, Chicago.

Screen-process ink is daubed on a sheet of glass, rolled down even

Work the roller back and forth until fully coated with the ink

Lay leaf face-down on newspaper. Apply ink generously with roller

After pressing, carefully peel the leaf from the drawing paper, leaving a perfect printed reproduction

Ferris-Wheel Planter Is Unusual Yard Ornament

Like the seats on a real Ferris wheel, the eight flower boxes on this miniature replica are self-leveling and can be individually watered and tended by simply rotating the buggy wheels which are utilized to form the sides. The two wheels rotate on a pipe axle supported by a tripod-type framework, and the flower boxes are hung from equally spaced tie rods. Grover Brinkman, Okawville, Ill.

White Tabs on Croquet Arches Easily Seen for Twilight Game

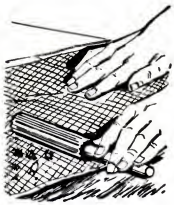
When played on dark days or in the growing shadows of late afternoon, a game of croquet will progress more rapidly with the help of white tabs fastened to the croquet arches. The tabs, plainly visible at a distance, can be made easily by using short lengths of adhesive tape folded around the centers of the arches with the ends stuck together and allowed to hang.

Trailer Refrigerator Kept Neat

People who travel with house trailers will find toy balloons a boon in holding contents of the trailer refrigerator safely in place when on the road. Low in cost, the balloons inflate to any size and tuck into odd-shaped spaces to hold food containers snugly. Being waterproof, they can be used alongside ice blocks.

Mrs. Harvey Muller, Danboro, Pa.

Rubber Hose Removes Burrs From Clothing

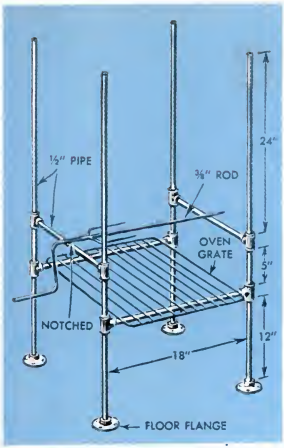


Prickly burrs and weed seeds are easily removed from clothing with a piece of ribbed garden hose mounted on a dowel which serves as a handle. Place the cloth on a flat surface and then "brush" it with the hose. The result will be a more thorough job than is possible with a whisk broom, and with less difficulty. Hard-to-remove thorns come loose without having to cut them with a knife, which could damage the fabric. The dowel-rod handle should fit loosely enough to allow the hose to revolve around it.

Lawn Chair Equipped With Wheels and Adjustable Footrest

Your lawn chairs will be easier to move and more comfortable if they are equipped with wheels and an adjustable footrest.

Mount the wheels on an axle passed through holes drilled at the bottom of the front legs. The footrest is supported on 30-in. lengths of 1-in. electrical tubing which slide inside two 30-in. pieces of 1¼-in. tubing. Fasten the larger tubing at the bottom of the rear runners and above the axle on the front legs. Use 1 x 8-in. stock with a 1 x 4-in. heel stop for the footrest. Attach short pieces of steel angle to the ends of footrest, then bolt assembly to ends of smaller tubing.



Barbecue Cooks Food With Infrared Lamps

Neither smoke nor flame is a problem with this barbecue that utilizes infrared heat to roast meats. Also, only a small amount of heat is apparent, since infrared rays must penetrate an object before they cause heat. Because the penetrating rays roast food more rapidly than conventional methods, natural juices have less chance to escape, and foods barbecued under the lights are more succulent and retain more of their natural flavor.

The barbecue itself consists of a frame of ½-in. pipe, assembled to the dimensions given in the detail. Floor flanges on the lower ends of the four legs can be used to bolt the frame permanently to one spot, or the barbecue may be used as a portable unit. For winter storage the frame may be disassembled. Each piece should be marked to aid in quick reassembly. An oven grate makes a fine ready-made grill, or one can be assembled from heavy wire. The spit is bent from ⅜-in. rod. A U-shaped fork with sharpened tines is welded or riveted to the spit rod to hold roasts, hams and the like. An aluminum cookie sheet or pan is ideal for use as a drip pan, since it also reflects heat back into the food being barbecued under the lamps.

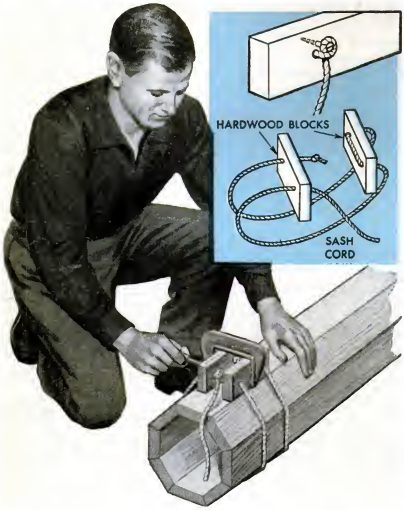
Photoflood spring-type clamps are used to hold the sockets into which the infrared lamps are screwed. The lamps should be the industrial-type which have a hard-glass face that will not crack or explode when grease or water is spattered against them. Do not use the ordinary "heat lamp" type of bulbs. Four 250-watt infrared lamps will use about 1000 watts.

Auto Windshield Cleaned With Corncob

One service-station operator uses corncobs as cleaning pads for removing bugs and other clinging debris from his customers' automobile windshields. The cobs are dipped into plain or soapy water and rubbed over the windshield until all the dirt is loosened, after which the glass is rinsed and dried. Each cob can be used many times, if it is rinsed after each cleaning.

Walter E. Burton, Akron, Ohio.

Adjustable Rope Clamp for Gluing Column Members Together



When numerous pieces of wood are to be glued together to form a round or polygonal column, one or more rope clamps like the one illustrated will prove helpful in holding the unit together while the glue dries. A length of sash cord is passed through matching holes bored in two hardwood blocks as shown, which are in turn held together by a C-clamp. To use the tackle, the rope loops are brought around the column, adjusted to proper length, and the free end locked by looping it on a wood screw installed in one of the blocks. The C-clamp straddles the blocks to pull them up tight.

Reinforcing Thin Sandpaper

Finer grades of sandpaper, which have a tendency to tear when clamped in a holder and used, can be reinforced by putting a piece of masking tape down the center on the back of the paper. Additional strength is possible by taping edges of the sandpaper that are clamped into the holder.

John A. Moore, Ruston, La.

Refill Cartridge Changes Fountain Pen to Ball Point

A fountain pen which has become defective is easily converted to an attractive ball-point pen by inserting a refill cartridge in the barrel. Remove the penpoint assembly and prepare the opening to receive the refill cartridge. If a small fitting remains inside, enlarge the hole in it to 5/32 in., the diameter required to accommodate the cartridge. If the hole is too large, wrap several turns of cellophane tape around the writing end of the cartridge to give it a snug fit when it is inserted in the barrel of the pen.

Box-Type Downspouts Assembled By Crimping Male-End Corners

Coupling of box-type downspouts often is a difficult job for the handy homeowner because the indented male end of a section will not always fit inside the next section, even after the rippled sides of the wider piece are hammered flat. This problem is solved by crimping the corners of the smaller end with a pair of pincers, being sure not to puncture the metal. This reduces the over-all cross-section and yet preserves the square shape, which would not be the case if the narrow end was squeezed out of shape to fit into the wider end. It also eliminates the need to disrupt the rippled effect which is carried the full length of the pipe, since the ripples on the wider end do not have to be flattened to accommodate the crimped piece.—Andrew Vena, Philadelphia, Pa.

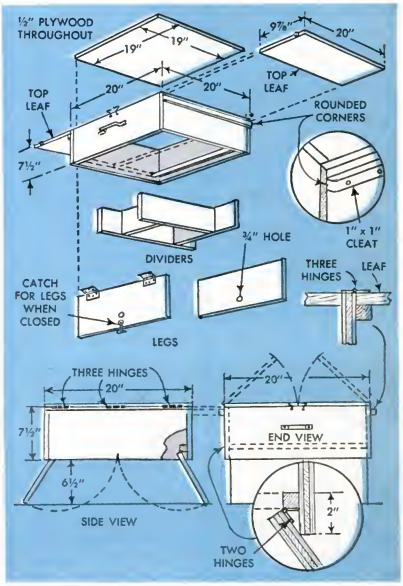
WTM '57

Plywood cabinet is portable food hamper that converts to sturdy picnic table with two extension leaves

Combination Food Hamper and Picnic Table

THIS EASILY CARRIED picnic cabinet provides a hamper for food and dishes and a sturdy table on which to spread a picnic lunch. Two hinged leaves on top swing open to double the top surface of the table. Two doors secure the contents when carrying the cabinet, and then become the legs when the food is removed and the cabinet is set up for use as a table. Since there are no complicated joints the cabinet can be built with hand tools, entirely of ½-in. plywood.

The dividers or shelves can be modified to accommodate large or small vacuum bottles and other containers. Assemble the four sides and top first, using waterproof glue and 6d galvanized finishing nails. Next, glue and nail the dividers and the 1 x 1-in. leg and leaf supports. Each door is fastened to a leg support with two 1½ x 2-in. galvanized hinges, each leaf with three hinges the same size. Accurate positioning of leg and leaf supports assures proper angle of table legs and leaves when in opened position. Install the three catches and metal carrying handle after painting or varnishing all surfaces of the completed cabinet.



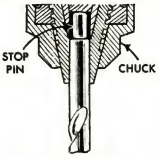
Safe Chip-Removal Method for Blind Recesses in Wood or Metal

When wood or metal work cannot be turned over to shake out chips from blind holes, do not attempt to blow the chips out directly and possibly have them fly into your eyes. Instead, use a length of small-diameter rubber tubing, slipping one end into the hole and blowing on the other. When rubber tubing is not available, rigid metal tubing or a long soda straw can be used by slipping it through the center of a paper or cardboard disk which will act as a chip shield.

Simplify Timing of V8 Engine

On some modern V8 engines it is difficult to reach the spark plugs to attach a timing-light lead. To overcome this problem, one mechanic connects the lead to the spark-plug wire at the distributor by using a connector "bar." The bar is a length of copper tubing that is fitted in the distributor cap in place of the spark-plug wire. The upper end of the tube is shaped to accommodate the plug wire. The timing-light lead then is snapped over the exposed tubing to assure a positive connection.

Stop Pin Lengthens Drill Bit



To lengthen a drill bit that is a little too short for a specific drilling operation, insert a stop pin in the chuck ahead of the bit. With this arrangement, exact drilling depth can be gauged and maintained. To attempt precision drilling with a short bit installed part way up in the chuck, without a stop pin, results in slippage of the bit and inaccuracy of depth. The pin should be small enough in diameter so that it is not gripped by the chuck jaws.

Feeding Trough for Sow

Old disk blades from a harrow, if rimmed with a welded metal band and the shaft hole sealed, are ideal individual feed troughs for sows in their pens. The blade hugs the ground so that a sow cannot put her snout under the edge to tip it, and the pan is heavy enough so that it will not move when in use.

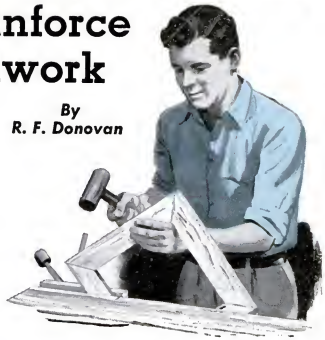
Steel Guard on Sickle-Bar Mower Prevents Damage to Fence Posts

To keep from splintering fence posts and severing fence guy wires when using a sickle-bar mower, one farmer installed flat steel guards on the ends of the cutter bar. The guards are about 2 in. wide and rounded at the front outside corner as shown in the photograph. Short lengths of tubing are welded against the inside edge of each guard and slip over the points on the adjacent ledger teeth, after which holes corresponding to the last bolt hole on either end of the cutter bar are drilled in the guards. The guards are then bolted in place. When in use, they tend to steer the mower around obstructions.

SN 57

Shop Notes

Six Ways to Reinforce Joints on Woodwork



By
R. F. Donovan

MAKE YOUR FURNITURE and other woodwork last longer and be more serviceable by reinforcing weak or loose joints. Of the many types of joints used in woodworking, the simpler ones shown here may be used either in new construction or in repairing loose joints in any existing construction.

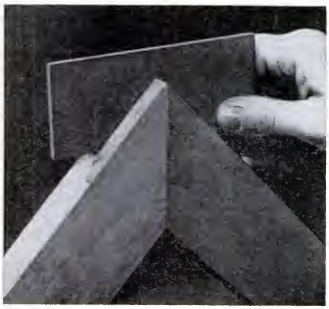
A quick and sturdy repair for corners, when pieces are simply butted together, is to use two dowels. Drill two holes through the outer member and well into the adjacent member and drive in glue-coated dowels. These should be flattened slightly on one or more sides to allow air and excess glue trapped at the bottom of the holes to escape. Trim the dowels flush and refinish. For an extra-strong joint use three dowels.

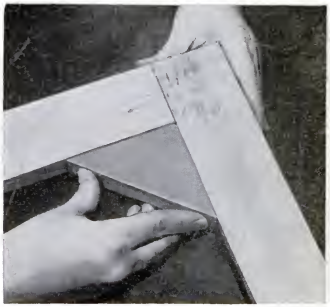
For picture frames, and other articles having mitered joints where inconspicuous bracing is required, use a thin piece of wood. Saw a slot across the joint to take a thin wooden block snugly. Apply a thin coat of glue to both sides of the block, insert it and clamp until dry. The block should be trimmed to fit flush and a matching finish applied on the exposed edge before it is glued.

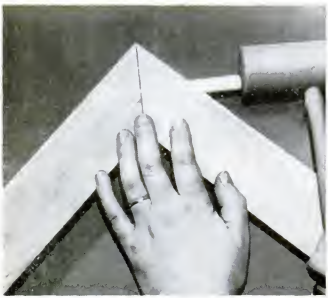
When a joint is weakened by rot or splitting and replacement is not warranted,

Above, members that are butted together are reinforced by drilling and fitting joint with dowels. Below, triangular block of wood fastened on inside surface of joint strengthens deteriorated members

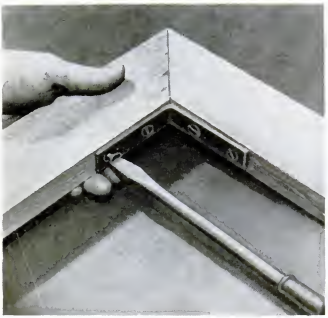
Thin piece of wood glued in groove cut across mitered joint provides inconspicuous reinforcement



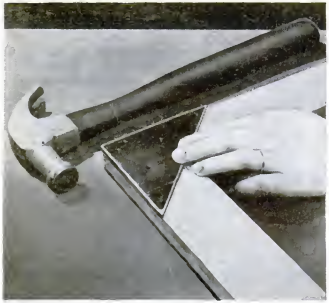




Above, for alternate repair of mitered joint glue dowel in hole drilled across joint at right angle



Metal brackets are easy to install on mitered joint, above, when appearance is secondary consideration. Below, triangles of thin plywood fastened on both sides of joint provide extra-strong reinforcement



fit a triangular wooden block snugly on the inside surface of corner and screw it in place. Drill pilot holes in the block and corner members and use screws long enough to penetrate sound wood.

Another method of strengthening a mitered joint is to drill both pieces at right angles to the joint and drive in a glue-coated dowel. Where members are of sufficient width reinforce the joint with two dowels. Trim and finish dowel ends when the glue is dry.

To save time when reinforcing a mitered corner use metal angle brackets on screen doors, windows and other places where appearance is not too important; brackets can be painted over to make them less noticeable. Also, these brackets are suitable for strengthening purposes where a surface is out of view, such as in drawers and the underside of some tables and benches.

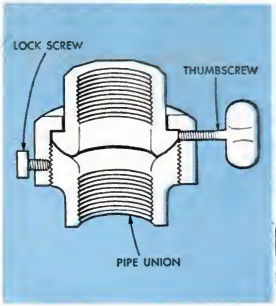
A very sturdy repair, and one that may be used when added thickness is no problem, can be made by gluing and nailing a thin plywood gusset over the corners of a joint. For added strength, gussets may be used on both sides of the joint. A sheet-metal gusset can be used where added thickness would prohibit this type of repair.

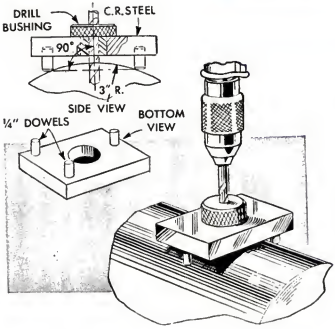
On a mortise-and-tenon joint subject to strain, such as the rungs on a chair, try locking the tenon with a small dowel. To do this, first glue and clamp the parts together. Then, at right angles to the joint, drill a hole through mortise and tenon, coat the dowel with glue and drive it into the hole to pin the end of the tenon tightly in the mortise. Trim away the projecting portion of the dowel, sand the surface smooth and refinish to match. Use of a hardwood block under hammer protects the dowel and surface of furniture. ★ ★ ★

When driving dowel for mortise-and-tenon repair use hardwood block to protect dowel and furniture

Pipe Union Serves as Revolving-Table or Tool Bearing

An ordinary pipe union can be converted into a sturdy bearing pivot for a revolving table or tool such as the vise shown in the detail. The collar is tapped at the leading edge for a lock screw which grips the piece the collar is threaded on, and another hole is also tapped in the collar at the sealing lip for a thumbscrew which, when tightened, prevents the sleeve inside from turning. Weld a pipe stand to the bottom and a table to the top.





Jig for Crossdrilling Cylinders

When drilling cylindrical work in a drill press, or with a portable drill, the problem of drilling holes precisely on the radial line is solved by using this simple jig and drill-bit guide. It consists of a rectangular piece of flat steel center-drilled to take hardened drill bushings which are tight fitting but removable. The jig is supported by three steel dowel pins that are driven into blind holes drilled in the bottom of the jig block. All pins must project down exactly the same distance, and are located as indicated in the detail. In use, the jig is placed on the work in the desired location. The drill bit is then lowered into the hole in the bushing which must be held or clamped to the work. Also, clamp the work in place so that it does not roll while being drilled.

Victor H. Tauferner, Hawthorne, Calif.

Carpenters' Pencil Clip Made From Clothespin

A flat carpenter's pencil will not fall out of your pocket if it is fitted with a clip made from a spring-type clothespin. Replace one leg of the clothespin with the pencil, grooving it to receive the spring as shown.

Asbestos Gaskets Seal Better When Soaked in Kerosene

When replacing asbestos gaskets in boiler fittings, steam lines, and other places where there is contact with live steam, a better seal will be obtained if each gasket is soaked in kerosene for a few minutes before installing it. The softened material will be forced into all the uneven places when the joint is tightened.

Tank Trailer for Hauling Water To Grazing Field

A 300-gal. tank mounted on a two-wheel trailer and towed by a tractor is used by one farmer to carry water to scattered grazing fields, where it is emptied into stock-watering tanks by means of a gravity-feed pipe-and-hose outlet. The frame and supports for the tank are made of channel and angle-iron members welded together and mounted on a front-wheel assembly from an old car. A jack telescopes into a pipe under the front end for use when the trailer is not hitched to the tractor. Any self-propelled vehicle with a suitable hitch can be used to tow the tank trailer.

Large-Capacity Milk-Can Rack

Assembled from lengths of pipe, this inexpensive rack holds large numbers of 20-qt. milk cans off the floor, allowing air to circulate freely about them for quick drying and airing. The rack, which has three tiers and accommodates 54 cans, is 12 ft. long, 14 in. wide and measures 3 ft. between tiers.

Up Outboard Performance With Suitable Propeller

WHETHER you use an outboard motorboat for fishing, towing water skiers, racing or as a passenger-carrying runabout, the diameter, pitch and blade area of the propeller act as a transmission in controlling the performance which the boat and motor will give. The same situation exists here as in an automobile, in which an engine of a certain power turning a drive shaft at a known speed must propel a craft of known weight and performance potentialities. Yet, many outboard owners are not aware of this fact and obtain far from optimum performance from their boats.

The illustration at the bottom of the next page shows the three main types of propellers. The two-bladed one is designed for high speed. The one with three blades is the average-duty propeller normally installed on the motor and good for all-around use. It offers a compromise between the high speed of a two-bladed propeller and the low-speed, four-bladed one. The latter is designed for use on heavy outboard cruisers.

As power increases, so does the number of propeller models. In the 10 to 15-hp. range motors are put to the greatest variety of uses, from operating a heavy 16-ft. work boat to driving a 10-ft. racer. The table below will help you to select one or more propellers most suitable for your needs.

Propeller blades that are damaged cause destructive vibration and reduce speed. Battered edges on an aluminum-alloy propeller can be trimmed with a file, but bronze propellers should be reconditioned by a reputable repairman, since a "pitch block," shown on page 195, is needed for reshaping.

Bob Whittier, Stoughton, Mass.

TABLE OF DIMENSIONS FOR PROPELLERS

Diameter	Pitch	No. Blades	Application
8½"	11½"	2	Racing runabouts, light loads
9"	7"	3	Heavy boats, heavy loads, 16-18 ft. cruisers, one engine, 19-23 ft. cruisers, twin engines
9"	8½"	3	14-16 ft. boats, 1-4 passengers
8½"	11"	3	12-14 ft. runabouts, 1-2 passengers
8¾"	9"	3	14-16 ft. runabouts, all loads, skis
9"	7"	4	16-18 ft. cruisers, one engine

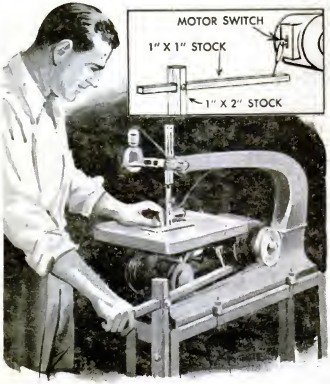
The main purpose in changing a propeller is to permit the motor to operate at its maximum efficient speed

Bronze propeller is hammered true on "pitch block," a metal form that is shaped to predetermined pitch

When repairing battered edge of aluminum-alloy propeller, file equal amount of metal from each blade

Propellers are constructed with two, three or four blades, depending upon size of motor and service

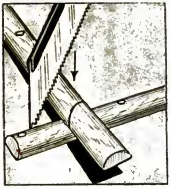
Motor-Switch Extension Handle Improvised for Use on Jigsaw



The wooden handle attached to the switch of this power jigsaw enables the operator to start or stop the motor instantly, merely by dropping a hand from the table to the handle. The handy device saves time on inside cuts, when it is necessary to start and stop the saw frequently, and is an added safety feature for a jigsaw equipped with a motor switch that is difficult to reach quickly. The handle and upright members for the device are cut from 1-in. lumber and fastened to the stand as shown. The handle is connected to the switch with a length of stiff wire or small-diameter rod, depending upon the type of switch.

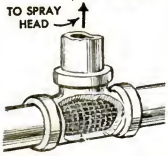
Richard Garland, La Porte, Colo.

Overlap Cut Gives Perfect Miter



When troubled by mitered corners which do not square-up when the two angle-cut surfaces are joined together, simply overlap the two pieces at right angles to each other, tacking them temporarily to a flat surface, and cut both at the same time. This will result in perfect mitered corners, gapless and square, and is practical for cutting moldings, screen and picture frames.

Fly Screen in Pipe Tee Prevents Clogged Sprinkler

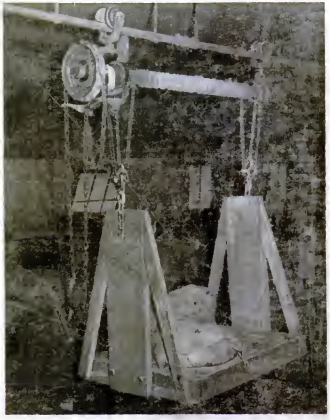


To prevent clogged spray heads in his overhead field and orchard sprinklers, which use water pumped from a stream, one fruit-grower installed a short roll of galvanized fly screen inside the pipe tee under each sprinkler-head riser. Drain plugs or caps should be provided at the end of each line so that accumulated dirt can be flushed out quickly by removing the plugs and inserting a hose.

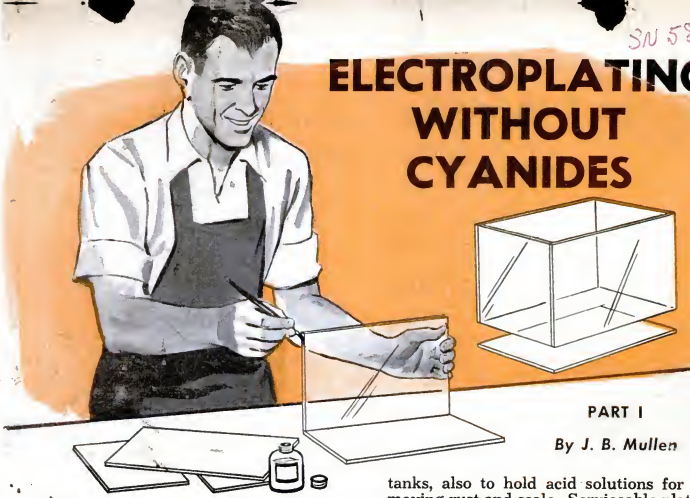
Rack on Litter-Carrier Hoist Used to Handle Poultry Feed

This wooden platform offers an excellent facility for distributing grains to feeding stations in a poultry house when it is attached to a litter-carrier hoist in the place of the litter bucket. When it is necessary to clean out the litter from the pens, the bucket is returned to the hoist. This arrangement works best where feeders throughout the pens are the large type holding a bag or two of feed.

Charles L. Stratton, Hollis, N. H.



¶A light coat of household wax applied to the top of a circular-saw table will keep it free from rust and make it easier to slide wood over it.



ELECTROPLATING WITHOUT CYANIDES

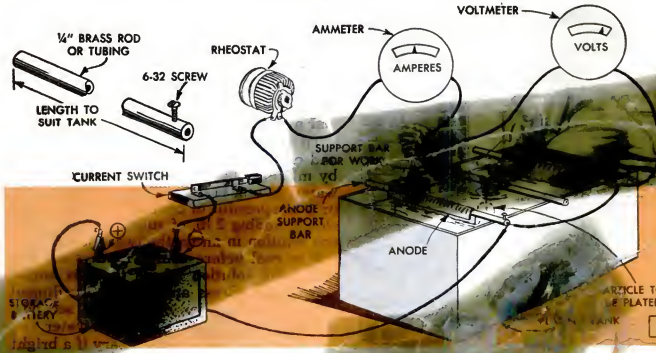
PART I

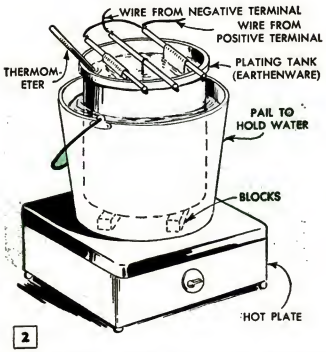
By J. B. Mullen

YOU CAN ELECTROPLATE articles of iron, steel or brass, with copper and other protective coatings, by using recently developed plating solutions made with fluoborates. **Although the latter are free from the extreme hazards of cyanides, they are toxic and must be handled with care.** Fluoborates come in the form of liquid concentrates, making mixing of plating solutions easier and more accurate. Most common metals, such as copper, nickel, cadmium and lead, can be deposited from fluoborate solutions.

For plating small items, old battery boxes or earthenware jars can be used for plating tanks, also to hold acid solutions for removing rust and scale. Serviceable plating tanks also can be made from clear acrylic plastic sheets as pictured above. Cut the plastic sheets carefully so as to assure straight edges. To assemble, dip or paint the joining edges with ethylene dichloride (liquid) and then clamp the parts together. A cement made by dissolving scraps of plastic in ethylene dichloride can be used to calk the joints.

For electrical supply, a storage battery can be used with a small power rheostat to adjust the current. A voltmeter of 10-amp. range and a switch, while not essential, are helpful. The electrical circuit for plating metals is shown in Fig. 1. To





When necessary, plating solutions can be held at given temperature in water bath arranged as pictured

Precleaning is first step to successful electroplating. Cleaning solution should be heated before use

support the work and anodes, which are metal plates used as positive connections to the tank and as a source of the plating metal, make up several brass or copper support bars as in the upper left-hand detail, Fig. 1. For some solutions a water bath consisting of a large kettle or pan filled with water, in which the plating tank can be heated, Fig. 2, will be needed. You also will require a thermometer for reading the temperature of solutions.

Surface Preparation

Good electroplating depends on having a smooth and clean surface on the underlying metal. Unless there are heavy layers of grease on the metal to be plated, begin surface preparation by scrubbing the article in a hot precleaning solution containing ½ lb. of sodium carbonate (washing soda) or trisodium phosphate and 4 tablespoonfuls of washing compound in 1 gal. of water, Fig. 3. After washing, rinse the item in a hot solution of soap or synthetic detergent, then in hot running water. Heavy layers of grease should be removed before the precleaning operation, by degreasing with carbon tetrachloride. **This operation should be done out of doors, Fig. 4, because of the toxic vapors.**

Remove grease and dirt with nonflammable solvent. Work should be done outdoors because of toxic fumes

To remove rust and scale from iron or steel, a pickling solution is made by adding ½ pt. of sulphuric acid to ½ gal. of water. **Add the acid slowly to the water and mix. Use the solution in an earthenware jar.** Immerse the work in the pickle, Fig. 5, as long as is necessary to remove the rust entirely. Then rinse thoroughly in hot and then in cold water, Fig. 9. **Acid solutions are corrosive to metals, porcelain fixtures, clothing and the skin. Wear rubber gloves and avoid splashing the solution.**

To remove scale and corrosion from brass [illegible] and copper, a bright-dip solution is made by mixing 1 lb. of nitric acid with 1 qt. of water, adding ¼ fl. oz. of hydrochloric acid or 1 teaspoonful of common salt and then slowly adding 2 lb. of sulphuric acid. Mix the solution in an earthenware jar and allow to cool before [illegible] use **the bright-dip solution** [illegible] **ample ventilation.** Brass [illegible] dipped **in this solution** for [illegible] seconds, then **rinsed** immediately [illegible] water.

Polishing usually is necessary if a bright

plated finish is desired. On articles that are comparatively clean, polishing can be done before any cleaning operation. Otherwise polish only after precleaning and pickling. Polishing is done with aluminum oxide (No. 80, coarse, to No. 220, fine), tripoli, lime and rouge. Aluminum oxide is used for preliminary polishing, the last two abrasives being suitable for producing a high luster (coloring). For medium luster use a sewed-cotton buffing wheel and for a high luster use a loose wheel. Apply polishing compound (in stick form) to the wheel while running and hold the work low on the wheel as in Fig. 6. Keep work in motion so as not to scuff the surface.

As a final preparation of the work for plating, an electrocleaning bath containing 4 oz. trisodium phosphate and ½ cup synthetic detergent is prepared in a large can or pail. Connect the negative terminal of the battery directly to the container, Fig. 7, and suspend the work from a support bar, which is insulated from the tank by wooden blocks. Heat the solution to 180 deg. F., or higher, then connect the article to the positive side of the circuit. Adjust the rheostat to produce a vigorous bubbling action. After a minute or two, remove the work and rinse in hot and cold running water. From this point on the work should never be touched with the hands. Neither should it be allowed to dry. After electrocleaning and rinsing, water should remain on the surface of the work in an unbroken film, Fig. 8. If the film breaks over some areas, repeat the precleaning and electrocleaning processes.

Sometimes a dark film remains on the metal after electrocleaning. This can be removed from iron or steel by a quick dip in a solution of hydrochloric acid, 6 oz., in 2 qt. of water. After this operation, the work should be plated immediately without being allowed to dry.

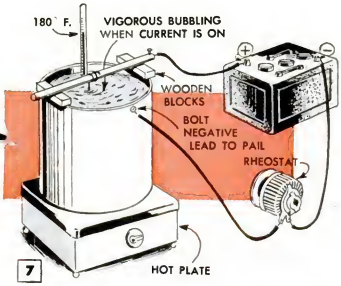
Copper Plating

Steel parts to be copper plated are first given a copper strike (thin copper coating) in a special solution made up as in Fig. 10. Dissolve the copper sulphate in ½ gal. of water and add sodium oxalate, which has been dissolved separately in another portion of the water. Stir the mixture while adding triethanolamine until the precipitate that has formed dissolves, then dilute with water to make 1 gal.

Connect the work as in Fig. 1 to the negative battery terminal and hang pieces of copper from the anode-support bars, the latter connected to the positive terminal. Plate at approximately 1½ v. for 3 to 5 min. Then rinse thoroughly to remove the alkaline strike solution.

Copper fluoborate comes in the form of

FOR BRASS AND COPPER	
NITRIC ACID	1 LB.
HYDROCHLORIC ACID	¼ FL. OZ.
WATER	1 QT.
SULPHURIC ACID	2 LB.
FOR STEEL	
SULPHURIC ACID	½ PINT
WATER	½ GAL.
NOTE—ADD ACID TO WATER	



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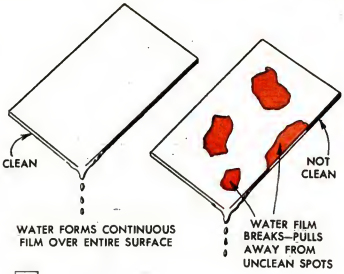
Electrocleaning is last step before plating. Work should not be handled, or dried, before plating



8

Work is chemically clean if water remains on surface in unbroken film. If film breaks, repeat processes

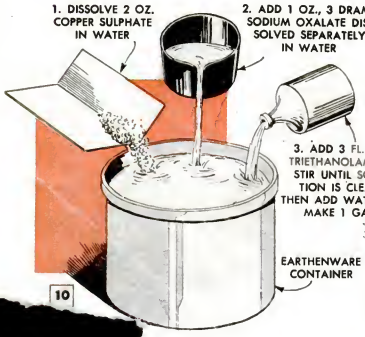
Importance of rinsing after each step cannot be overstressed. This can determine success or failure

9

a concentrated solution containing 45 percent by weight of copper fluoborate. To prepare a plating solution, mix ½ gal. of the concentrate with ½ gal. of distilled water. Hang plates or sheets of pure copper from the anode bars, which are connected to the positive terminal of the battery as in Fig. 1. Pour the plating solution into the tank. Best results will be obtained with the solution at a temperature of 80 to 90 deg. F. It may be necessary to heat a part of the solution separately and then return it to the tank to obtain the desired temperature. Or, use the water bath, Fig. 2.

The work, properly cleaned, is then suspended from the center, or cathode-support bar. Adjust the rheostat to 4 to 6 v. and observe the copper deposit as it forms. Increase voltage slightly if the copper is slow to form, or decrease slightly if the deposit is coarse grained, or rough. Another way of controlling the deposit is to adjust the

Steel parts to be copper plated are given a copper strike with solution made up as detailed below



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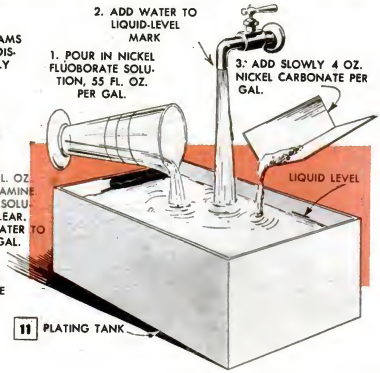
Nickel plating follows copper plating, solution being prepared as detailed. Be sure to clean plating tank



11 PLATING TANK

current based on the area of the work surface. For every 10 sq. in. of surface use a current of about 1-amp. density. Thus a small tray, 8 in. long with an average width of 3 in., would have a surface area of 48 sq. in., requiring a current density of about 5 amp. At 5 amp., plating time should be about 40 min. If the work is to be nickel plated, remove from the plating solution and rinse thoroughly. Then place in the nickel solution without handling or drying. Otherwise the copper-plated item should be dried and lacquered.

Nickel Plating

A nickel-plating solution is prepared as in Fig. 11, pouring nickel fluoborate into the water, then adding 4 oz. of nickel carbonate and stirring with a wooden paddle until dissolved. Hang the work from the center, or cathode bar, and adjust the rheostat to give 2 to 3 v. Increase or decrease voltage as required. Plating time should be about 50 min.

Chromium Plating

A chromium-plating solution is made by dissolving chromic acid, 53 oz., in sufficient water to make a total volume of 1 gal. After this has dissolved, add 2 fluid drams (8 cc.) of concentrated sulphuric acid. **Both chromic and sulphuric acids are highly corrosive; handle with extreme care.** Warm the solution to an operating temperature of 100 deg. F. Use plain steel anodes. Suspend the item to be plated from the center support bar and cover with several sheets of newspaper before turning on the current. Adjust the rheostat for about 4 v. Turn off the current after 10 to 15 sec. and note if the plate is forming. Adjust the voltage, if necessary, until plating forms. When plating begins, keep temperature and voltage constant. Plate 3 to 5 min. Then rinse, dry the work and polish with a loose cotton buffing wheel.

(To be continued)

Faulty Voltage Regulator "Shorted" Out of Circuit

As an emergency measure only, when the voltage regulator on your car fails to operate, connect a jumper wire between the armature and field poles on the generator. A third post on the generator is grounded and should not be used. Connecting of the two posts "shorts" out the regulator and produces maximum generator output, which eventually would overcharge the battery and burn out the electrical components on the car. Therefore, the car should not be driven more than a short distance with this jumper-wire arrangement.—Don Engdahl, Santa Rosa, Calif.

Coupling Handle on Tractor Plow Provides Safety Measure

A safety feature for coupling a plow to a tractor is this long handle bolted to the plow tongue. To make the handle, one end of a heavy rod is bent at a right angle for a handhold, while the other end is welded to the head of the bolt in the plow tongue. Since the operator stays on the tractor seat while coupling the plow to the tractor hitch, there is no chance of pinched fingers and the tractor remains under complete control at all times.

Multiple Baking Pans With Handle Provide Portable Parts Tray

Commercial-type baking tins, which are bound together with metal straps, are used by one farmer as handy trays for nuts, bolts and miscellaneous parts in his farm shop. Fitted with a handle, as shown in the photograph, the trays are used to carry parts for repairing the tractor in the field, fence-mending and other jobs away from the shop.

SHOPPING FOR TOOLS

PERSPECTOGRAPH simplifies and speeds up draftsman's job of transcribing plans and blueprints into perspective drawings so that parts and assemblies can be more easily visualized in appearance and relationship. Eliminates the preliminary work ordinarily required to plot a perspective drawing and work it out in detail. Easily attached to any drawing board with thumbtacks. Consists of a calibrated sweep arm and a cylindrical chart of curves by means of which a pattern of dots is transferred from the original orthographic drawing. Connecting these dots with straight and curved lines gives a perspective of the original

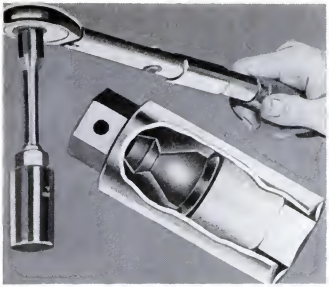
Perspectograph Corp., 285 Madison Ave., New York City 17

POCKET MAGNET is fountain-pen size for convenience in handling and carrying. A swiveling handle is attached to the unbreakable plastic barrel, or case, permitting the latter to swing freely when in use. Locates hidden nails, wall studs, tacks, nails and metal chips in tires, pulls metal chips out of blind holes. Magnet exerts pull equal to 100 times its weight

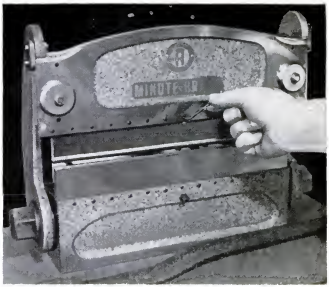
Reder Mfg. Co., 3523 Martens St., Franklin Park, Ill.

MITER CLAMP is designed not only to clamp the mitered joint tightly for gluing or nailing, but also to permit "sawing down" one or more of the four joints in a mitered frame to correct a slight error in cutting the stock to 45 deg. Enables user to make perfect mitered joints on picture frames, screens and cabinet doors. Takes straight-edged stock up to 2 in. wide

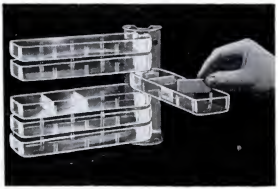
Gunver Mfg. Co., Manchester, Conn.



SPARK-PLUG SOCKET has a formed rubber insert which grips porcelain tip of plug and withdraws it with socket. Eliminates possibility of breakage when unscrewing plugs from deep recesses in cylinder heads
Plomb Tool Co., Los Angeles, Calif.



SHEET-METAL BRAKE combines a shear capable of handling sheet metal up to 14 ga. Takes stock up to 12 in. wide, develops 4½-ton pressure for hemming, bending, flattening, corrugating, boxing and shearing
Rotex Punch Co., 2350 Alvarado St., San Leandro, Calif.



SWINGING BINS are hinged to a metal bracket which is attached to the wall or tool panel over the workbench. Each bin is of clear plastic so that the contents are easily seen as in the photo at the left. Three dividers per bin, center photo, make it possible to keep small parts separate in individual compartments. Bins swing individually as in the center and right-hand photos. Available in several sizes
Mid-Continent Hardware, P.O. Box 111, Lee's Summit, Mo.

HEIGHT GAUGE has a micrometer head which raises and lowers a series of blocks, or steps, spaced 1 in. apart. Settings within .0001 are possible throughout the range of the instrument. Comes in two heights
Brown & Sharpe Mfg. Co., Providence 1, R. I.

GUIDE FOR HAND TAP takes standard taps up to ½ in., assures straight, true thread and reduces tap breakage to minimum. Suitable for use with any tap, taper, plug or bottom type. Comes with wood holder
Griffith Tool Co., 237 E. Crescent, Elmhurst, Ill.

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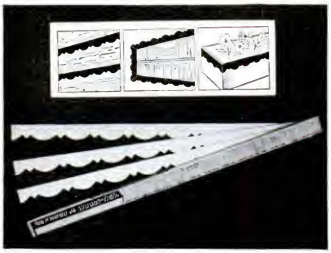
Reardon Company, St. Louis, Mo.



PLYWOOD TRIM KIT consists of 3 strips of birch plywood, each strip having one edge attractively scalloped. Thoroughly sanded, ready to finish with paint, or stain and varnish. Makes perfect trim for shadow box, picture frame, shelf, bookcase or room cornice
Direct Promotions, 33 W. 46th St., New York City 36

COUNTERBALANCED, DOUBLE-HUNG SASH opens simultaneously at top and bottom. As lower sash is raised, upper sash lowers an equal distance. Comes as a unit ready for installation. Made of aluminum with special weather stripping and trim that snaps on
Per-Fit Products Corp., 1216 E. 52nd St., Indianapolis 5, Ind.

WOOD TRIM in strips of veneer thickness is now available for finishing the exposed edges of plywoods. Strip, or tape, is 1 in. wide and comes in a variety of woods to match any hardwood-faced plywood. Applied with ordinary glue. No heat or clamping required
United States Plywood Corp., 55 W. 44th St., New York City 36

BASEMENT WATERPROOFER seals porous, leaky walls watertight. Available as two separate components which are mixed before application to the wall. Application is made with brush, spray or roller after wire-brushing and cleaning the masonry surface
American Metaseal Mfg. Corp., West New York, N. J.

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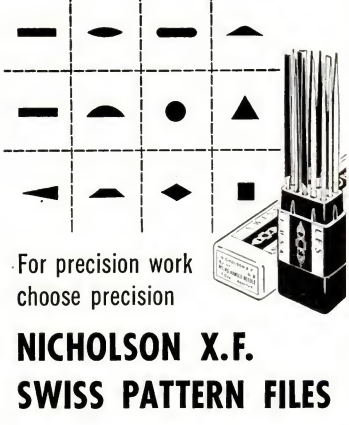

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Shellac Finish

Q—Recently I acquired a very old chest of drawers. On removing the paint I found that the wood was curly maple. I was told to finish the wood with orange shellac. The shellac remained sticky for days, never really dried hard. Now I'm wondering what I did wrong.—O. G., N. H.

A—Of all the possible causes, we think the most likely one is that you used shellac which was too old. Shellac, especially that from a can which has been opened and resealed, is not always reliable after storing for a long period of time. If this guess is correct, then the only thing to do is remove the shellac with alcohol, sand the wood to remove any residue and refinish with new shellac. However, as already stated, there are other possible causes and perhaps the most likely of these is a lack of air circulation in the room where the refinishing was originally done. This condition also can cause failure of shellac finishes. Another possible cause, more remote but still a possibility, is the type of finish which was applied to the chest at the time it was made. Some of the very old finishing materials contained wax in some form. In some cases these were penetrating finishes, a residue of which might tend to affect normal hardening of subsequent finishes. In applying new shellac we would cover only a small area as a test. If the new material dries properly then it likely will be safe to refinish the chest.

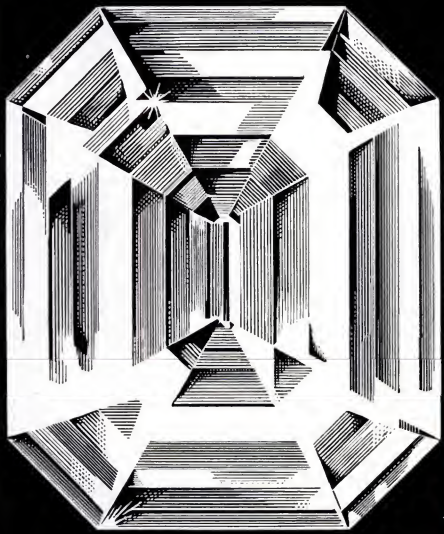
Early Planting

Q—For two seasons I have planted garden seeds early and have had rather indifferent success. I've always understood that early planting was the approved procedure, the purpose being to take advantage of a cool growing season and ample early-spring moisture. Only about half the seeds I plant germinate and the resulting growth is anything but healthy. What is wrong?
—L. H., Mich.

A—Much depends on what you mean by "early planting." Much also depends on the kind and condition of the soil in the garden plot, how the seeds are planted and on the vagaries of the season

(Continued to page 208)

"WHITE RUBIES"



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City_____ Zone_____

County_____ State_____

after planting. In your area a late frost may occur somewhere between May 1 and May 10. Although frost is only a possibility and by no means a regular seasonal occurrence, weather conditions preceding these dates are not likely always to be favorable for garden plantings. Seeds planted in heavy, wet soils in cool weather are certain to germinate slowly, if at all, and the seedlings that survive seldom attain vigorous growth, even though growing conditions later on may be favorable. Successful gardeners do not plant until the soil is sufficiently dry to work easily. Heavy, clayey soils require a longer dry-out period than do sandy, gravelly soils. Small seeds such as radish, lettuce and onion should be planted in shallow trenches and covered lightly with fine soil. Transplants such as cabbage and tomato require good growing weather and plenty of warmth. Even though they are set out late by the calender, they usually will make up for lost time by a more rapid growth. Experienced gardeners always wait for favorable weather conditions.

Cracks in Brick

Q—My home is brick-veneer construction, about 20 years old, 1½ story with basement. Two years ago I first noticed cracks in the basement floor and foundation and lately cracks have appeared diagonally across the exterior wall at one corner above the grade. Also, the plaster is beginning to crack in a corner of one room. What could cause this defect in a house 20 years old?
—O. D., Ill.

A—If we can judge correctly from your description you will have to do a major repair job in order to remedy the condition permanently. Not knowing the area we can only guess the probable cause, but it seems most likely that the portion of the structure that is breaking away was built over a cinder fill and that the cinders under the foundation have deteriorated to the point where they no longer give adequate support. Of course, it is not possible to say how long the settling will continue, or to what extent the cracks will open. Perhaps it would be a good idea to test this by pointing up one of the cracks for a short distance with mortar. Mix a fairly stiff mortar and force into the crack, making sure that it adheres to both sides. The total length of the portion of the crack filled should be about 18 in. Smooth the joint carefully and then note the result over a period of two months or so. If the joint opens, that is, the mortar breaks away from the brick on one side or the other of the crack, it is reasonable to assume that settling of that portion of the wall affected is continuing. In this case it probably will be necessary to excavate, remove the footing, foundation and brick below the crack, or cracks, and rebuild, beginning with a new footing, pouring new sections of the basement wall and re-laying the bricks in that part which has broken away. However, if the test joint does not open after a lapse of time then it is just possible that pointing the cracks with mortar will effect a reasonably satisfactory repair.

Layering

Q—What is the meaning of the term layering when referring to plant propagation?—U. P., Me.

A—Well-known examples of natural plant propagation by what is known as layering are strawberries, dewberries and black raspberries. Strawberry plants send out runners each season which root in the soil adjacent to the parent plant and thereby establish a new plant, or plants, depending on the number of runners. Dewberries and raspberries root at the tips of the canes which bend naturally until the tips contact the surface of the soil. Gardeners practice simple layering by bending the canes in the late spring and covering them near the ends with soil to a depth of 2 to 4 in. In this procedure the tip must be left exposed.

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Tropical Fish Are Fun

(Continued from page 101)

Male bettas here are usually kept in small bowls in solitary splendor. To breed them, male and female betta must be kept in a special plastic tank with a Plexiglas partition between them, until they get used to each other. One day Mr. Betta will blow masses of sticky bubbles that cover the surface. That's the egg nest. The partition is pulled out and Mr. Betta proceeds to squeeze the eggs from Mrs. Betta by wrapping himself around her. Then the male pushes the eggs up to his nest and guards them. Many tropicals blow these odd bubble nests which the male guards jealously.

In some families of tropical fish, either the male or female hatches the eggs by mouth. In one variety called the Egyptian mouthbreeder, the female does the job. As eggs hatch, the young swim out of her mouth, but for some time afterward, in times of danger, the fry dart back inside her mouth.

Still other tropicals are "live bearers," giving birth to strings of wiggly youngsters. Beginners soon learn the unhappy fact that many fish will eat their offspring unless special care is taken. Even the best aquarium hasn't the hiding places nature provides. Plastic breeding tanks called "traps" — divided by partitions with tiny slots through which fry can swim but parents can't—are the answer if you want the fun of seeing baby tropicals grow.

Bettas aren't the only fierce fish among tropicals. One tank in John Groetzinger's aquarium bears the sinister label "Murder,

(Continued to page 212)

Fish now are mailed in plastic bags packed in cartons. "Shot" of oxygen added to water keeps fish alive

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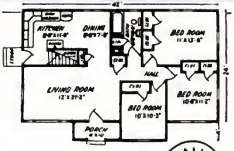

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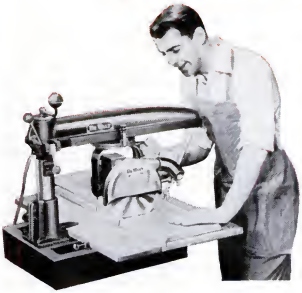

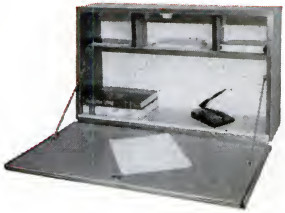

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AT LUMBER & BUILDING SUPPLY DEALERS

Inc." In it is a shimmering group of three-inch tropicals with names like "Jack Dempsey," "flag fish" and "jewel fish." "We put the 'Murder, Inc.' label on there the day a new attendant put a black-spotted Jack Dempsey in a carton with eight neons," recalls Groetzinger. "In less than 10 seconds there was only a Jack Dempsey left."

Finny characters like these are kept in isolation tanks. But you don't have to go in for ferocity to be a tropical-fish fan. Most of the moderately priced little fellows are sociable and some are extraordinarily curious.

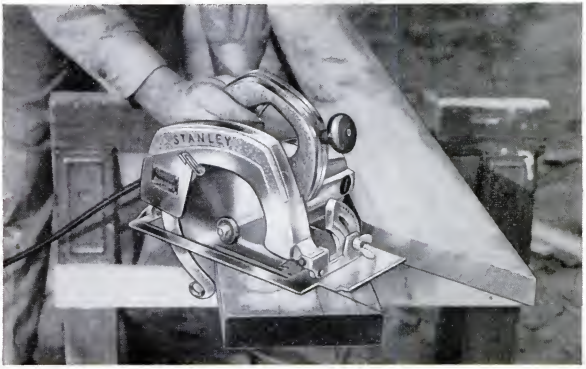
Amusing, for instance, are the pinkish white kissing gouramis that chase each other around the tank and hitch their mouths together. They'll continue "kissing" for a minute or more. No one knows why. And when not kissing another of its kind, a kissing gourami may try kissing its own reflection in the glass.

In a big tank in Dalwin's aquarium emporium you can see another curious fish called a headstander. He spends his life swimming around timidly with his nose pointed at the bottom of the tank as though there were a weight in it. There are tiny, silver hatchet fish, triangular in shape; blind cave fish with beautiful pearlescent bodies. One funny fellow called the archerfish eats flies and insects that have the misfortune to fly over the tank. He spits droplets of water at them, pegs them on the wing and knocks them out. They tailspin into the tank and are promptly snapped up by the archer. Ken Zinck, manager of the Westchester Aquarium, once stuck an artificial fly on a piece of paper above the archerfish tank and crowds gathered to watch the odd tropicals at target practice. "Their score was hot," says Ken. "They could shoot a droplet with a wallop at 12 inches." Every time Zinck and his assistants walked past that tank afterward, a barrage of droplets was shot at them by the archers.

Most tropicals today cost from 25 cents to a few dollars a pair, depending on breed, size and age. Few are really "rare" anymore. But you may still be exclusive if you can afford it. John and Elinor Groetzinger have a tank of slender black ghost-fish that will cost you $100 per. About four inches long, they resemble miniature eels, with two undulating fins running the length of their bellies. "They can move backward as quickly as forward without even shifting gears," John explains, "as you soon learn when you try to net one. Few are caught because they're so timid, and there's only one place they're found—an Amazon tributary, where

(Continued to page 214)

new saws that DO MORE and COST LESS



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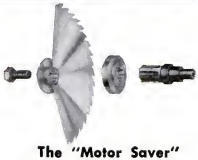

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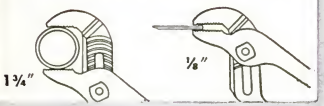

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natives believe they are the spirit of a murdered white man and, therefore, refuse to catch them."

Even more exclusive are the discus, or pompadour fish. A full-grown pair (each about five inches long) have a tank to themselves in Dalwin's fishery. He calls them "King and Queen of all tropicals." The timid, disk-shaped beauties have brilliant colors that change from red to orange to brown to blue or green at the discus' whim. A grown pair is worth up to $1500; small ones about $25 to $45 apiece.

Another exotic fellow is an eight-inch, mottled-brown monster called a lionfish, whose spiny dorsal fin resembles a lobster's feelers. He carries a poison bringing fatal illness to anyone who touches it.

Dalwin or Groetzinger will be glad to order you a piranha — famous Amazon man-eater about 10 inches long. Swarms of these powerful-jawed fish with silver and orange scales have been known to pick a man to a skeleton in a matter of minutes. A baby will cost you $12 to $65; a mature one between $75 and $300 depending on color and size. One of these aggressive fellows at Groetzinger's has battered himself into retiring timidity from smashing against rocks when darting after live goldfish which he demolishes with a gulp.

Actually, a few dollars' worth of more genteel guppies, angels, tetras and the like can be as curious and interesting as the expensive varieties—and few people know the difference. Just for fun, Groetzinger bought some blacknose dace—prolific bait fish found in New England streams—and exhibited them at a recent trade gathering under their Latin name. "Everyone thought they were a new breed of tropical," says John. "No one thinks of local bait fish in terms of decorative fish, but some are very pretty. What's more, they keep well in home aquariums, get along well with tropicals and they're not fussy about water temperature."

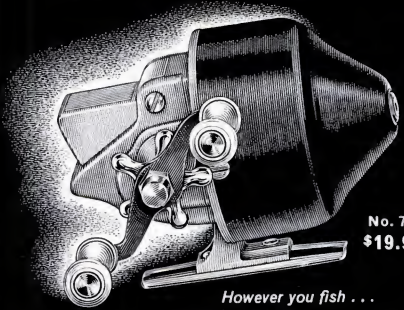
Despite the easy maintenance of tropicals, experts like Dalwin and the Groetzingers stress certain rules if you don't want your fun spoiled by high mortality. Biggest mistake among amateurs is overfeeding, they'll tell you. Most fish will eat dry food only as it falls through the water. What hits bottom remains there to decay and pollute the tank. That's why a siphon or dip tube is needed to clean the bottom occasionally. And every aquarium should have a scavenger, like a catfish, in its population. Gouramis and mollies also feed on bottom leavings.

"Pile sand or gravel three inches in back, one inch in front," advises Groetzinger.

(Continued to page 216)

New Bronson Spin-King

. . . the only reel that CAN'T TWIST LINE!



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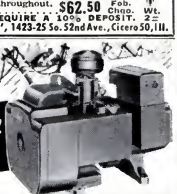

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OIL FILTERS

"This makes wastes roll forward where they're easily removed, and gives depth in back for water plants to root." An aquarium with good plants and scavengers takes care of itself, and you rarely need to change water. In fact, water change can be bad for tropicals. Experts pay a premium for "conditioned" water in which fish have lived a long time.

Depending on heat in your home, you may or may not want a thermostatically controlled heating unit that hooks to the tank side. Tropicals need 75 to 80 degrees for good health. Aeration assemblies that pump tank water through a filter and dump it back in the tank with a string of bubbles are not necessary but allow some 50 percent more fish in a tank without overcrowding. "With no aerator," Groetzinger will tell you, "the rule is two inches of fish per gallon. A five-gallon tank, with wide top to provide large air surface over the water will take eight to twelve fish. Better too few than too many."

An odd thing about almost any fish, according to Groetzinger, is that they never grow too big for a tank. A fish that grows 18 inches long in natural environment may only get two or three inches long in a tank.

The best tanks have stainless-steel frames with glass set in mastic. But painted metal is cheaper, safe and durable if the water level is kept below the metal rim.

Too much sun, you learn, is bad for tropicals. But hooded strip lamps that fit over the tank top will dramatically illuminate your fish and provide light that the plants need. Experts advise you not to use daylight-type fluorescent lamps.

A complete setup, fish and all, will cost about $20 or $30. This might include an inexpensive aerator, filter, heater and modest tank with breeding equipment to save some fry at least.

A relatively new wrinkle in tropicals for those who like something different is a salt-water setup — interesting because of the weird varieties of sea creatures it adds to home-aquarium populations. John and Elinor Groetzinger, enthusiastic salt-water tropical fans, predict they're the coming thing. "They take the same equipment," says John, "but instead of green plants you can have odd sea vegetation, bright coral, rocks and strange ocean-bottom creatures like starfish, queer snails and anemones that ceaselessly wave their tentacles." You need genuine ocean water, not just salt water.

More odd than the decorations are the fish—lumpy, ugly filefish with green fluorescent eyes; four-eyed butterflies, named for the black spots on their tails that look

(Continued to page 218)

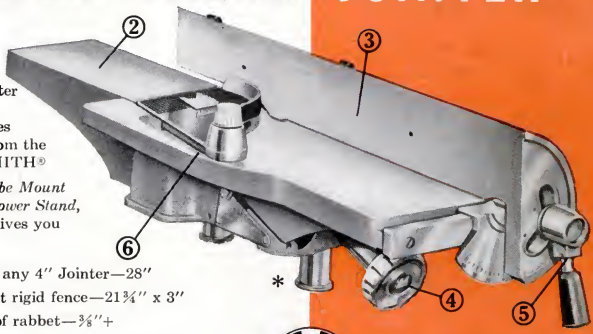
Pencil Magnifier

Artists, retouchers and draftsmen find many uses for a little magnifying glass that clamps onto a pencil or cutting tool. Used in picture retouching, cutting and etching, for silk-screen cutting, making fine drawings and cutouts, the glass shows the user an enlarged view of the section he is working on. It is also handy for looking up and writing down phone numbers.

Bell Ringer

Rudolf, family cat in a Danish home, rings the doorbell when he wants to enter. A paw pressed on a mat outside the door brings his 12-year-old master running. The boy, Aksel Peterhaensel of Odense on Funen Island, devised the feline doorbell.

Here's that new MAGNA *JOINTER*



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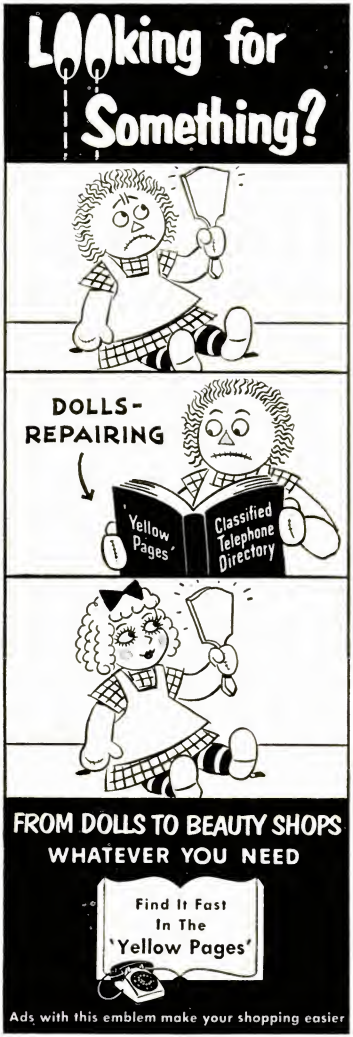


more like eyes than the real eyes up front. It's hard to tell if the squarish fish is coming or going. "Nature's idea," explains Elinor, "was to confuse his enemies and make them attack the end that could bite back."

Some marine tropicals don't even look like fish. A yellow character called a cowfish is shaped like a one-inch square box with a protuberance at one end exactly like the head of a cow—horns and all. He has ballast tanks and goes up and down in the water like a submarine. He can spin, spiral, scoot or—if frightened—turn upside down on the surface and play possum. "When he does that," explains Groetzinger, "he thinks nobody can see him."

Marine tropicals are often more whimsical than fresh-water types. Take sea horses, for instance. When the Groetzingers first began breeding them, they kept finding dead males atop the water. "Finally," says John, "we learned why. When a lady sea horse lays eggs, she puts them in a pouch in her husband's stomach and he hatches them. During this process, the two of them romp around the tank together. One day I noticed a dancing male swim through the aerator bubbles. Instantly his pouch closed and he quit dancing. He thought he had an egg in there. That was our answer. All those males had died of frustration waiting for air bubbles in their pouches to hatch out little sea horses."

The Groetzingers solved the problem by tying a woolen thread to every male-sea-horse tail, and weighting it with a button. "This was just heavy enough to yank the pouch open now and then when the male danced around," says John. "Any air bubbles escaped and wised Mr. Sea Horse to the fact that his trouble was just gas."

A curious thing to remember is that as sea water evaporates you don't add salt water, but fresh water. The salt doesn't evaporate. If you added ocean water, you'd soon have too much salt in the tank.

Marine tropicals aren't so fussy about temperature and survive nicely at 55 to 75 degrees. They have fewer ailments but need more aeration and live food. Small sea horses eat things like brine shrimp and daphnia; bigger ones need live guppies. Since sea horses have very small mouths, they must be kept in a separate tank or other fish will eat everything before they get a mouthful.

Such odd characteristics are things you learn yourself when you go in for tropical fish. It doesn't matter whether they're fresh-water or marine types, there are still plenty of things the books won't tell. But you can be sure of one thing: you'll find these finny pets completely absorbing—capable of new tricks every day. ★ ★ ★

Thor's 7¼-inch heavy-duty saw

NEW THOR SPEEDSAW

An industrial tool... at a home-shop price

MODEL 475... ONLY

$64.95

This new electric Thor SpeedSaw meets a long-felt demand by contractors, woodworking plants and home workshops. It has power to handle the toughest jobs; does fast, accurate precision cutting, and costs about half what you'd expect.

Thor SpeedSaw's universal motor delivers a full 1.75 horsepower. Expert carpenters appreciate SpeedSaw's all-ball-bearing construction, light weight (only 14½ lbs.), and easy wingnut adjustments for angle and depth of cut.

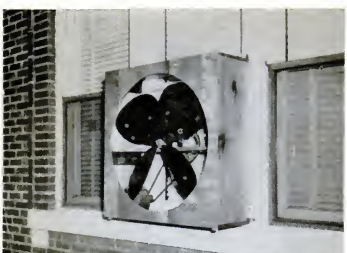
SpeedSaw's automatic telescoping blade guard affords complete protection for the user. Thor SpeedSaw is guaranteed by the world's largest manufacturer of portable power tools. SpeedWay Mfg. Co., a division of Thor Power Tool Co.

Thor SpeedTools

THOR POWER TOOL COMPANY, Aurora, Illinois

Branches in all principal cities

World's largest exclusive manufacturer of portable air and electric tools



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Sizes are available for every need.

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You buy direct from Manufacturer. Orders accompanied by check or money order shipped postpaid. Deposit of $3.00 required on C.O.D. orders. Immediate delivery. Satisfaction guaranteed. Circular Free. Dealer inquiries invited.

FAN KIT COMPANY
154-F, NO. BELVEDERE
MEMPHIS, TENN.

Water Is Pumped a Mile High to Hawaiian Cattle Ranch

(Continued from page 104)

pressure at the pump head runs from 550 to 575 pounds per square inch. The 1½-inch pipe is not guaranteed to withstand this pressure, but there has been no breakage due to internal strain.

The Horseshoe One ranch uses a four-cycle, kerosene-burning, 12 to 13-horsepower engine weighing over a ton.

The pumps push 1600 gallons of water mountainward each hour. They can do it 24 hours a day, seven days a week.

Water Cleans Pipes

Strangely enough the brackish water keeps the galvanized line clean as a whistle. Not so the pure rainwater. During the rainy months, at 3200 feet, fresh water is collected from a small shed and flows down the line to the cattle below. It doesn't take pure water long to rust and corrode the pipe, but a week or so of brackish water from the well cleans this corrosion out.

In order to service the water system, there is a telephone at each pump rig. To safeguard the pumps, there is a low-water cutoff switch that works on the magneto and the engine is killed if the water source is cut off or lost.

As a result of the Ghyben-Herzberg lens, the cattle no longer have to be rationed water, and sometimes the people of Kona hook into the line when there is no rain to get water for particular uses. ★ ★ ★

Milwaukee Glacier

What is now Milwaukee, Wis., was buried under thousands of feet of glacial ice only 10,700 years ago. Geology professor Dr. Richard F. Flint of Yale University has obtained the evidence with carbon-14 dating methods. The last big ice push covered a region from Duluth, Minn., across the Great Lakes to Lake Champlain in New York, and advanced southward at a rate of 960 feet per year. It stopped finally at Milwaukee, and after a few hundred years began retreating. By 8200 years ago, it had receded to the vicinity of Green Bay, Wis., 170 miles north of Milwaukee, and by 6500 years ago it had melted from all the Great Lakes region. Glacial ice, Flint says, covered the area northwest of Hudson Bay 4000 years ago.

¶Heat plus a chemical, triethylene-melamine, has checked experimental cancers growing in yolk sacs of embryonated eggs, Drs. Alfred Taylor and Roger Williams of the University of Texas have announced.

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THE HAWTHORNE A compact, livable floor plan. Every foot of space put to good use. No wasted building dollars—more closet space than many larger homes. House above shown with carport and planter.

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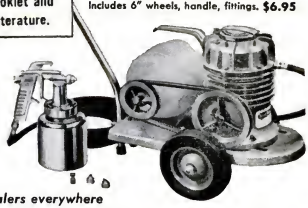
No. 890 Speedy Sprayer $38.50

Add wheels with Wheel Kit No. 909. Includes 6" wheels, handle, fittings. $6.95

FREE! Write for "How to Spray" Booklet and Literature.



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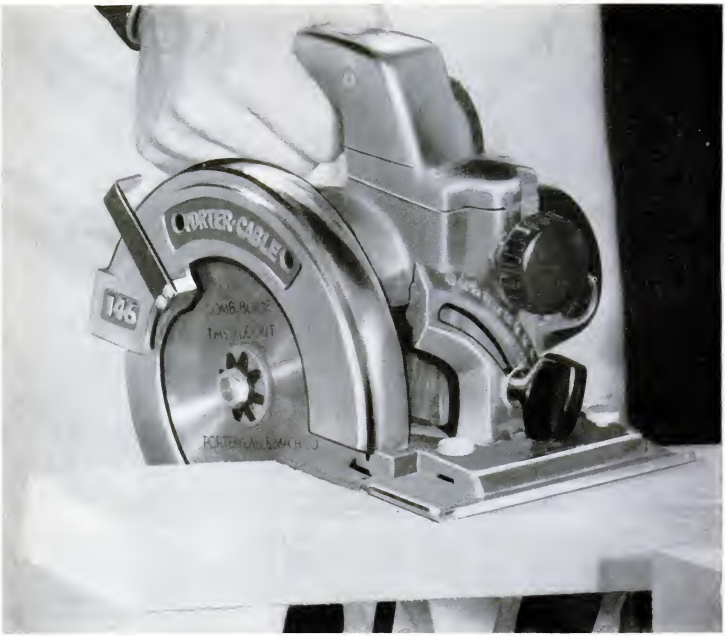

Tremendous values in these

three great new Porter-Cable saws!

From Porter-Cable's fifty years of leadership in electric tool design come these three brand new power saws . . . farther ahead than ever in design, in versatility, in solid *value*.

Model 146 is a rugged 6½″ saw of full *professional capacity*—makes every cut it takes to build a house. It slices through 2″ dressed lumber, even at a 45 degree angle—has a host of special features for convenience and long life. Yet it's priced at only $69.50—and you'll find a special Introductory Offer on the opposite page that saves you $12.00 on a complete Model 146 Kit!

If you prefer a saw with blade on the left, be sure to see Porter-Cable's new Model 157, shown opposite—a big, husky 7¼″ professional saw with exclusive Kickproof Clutch, full ball bearing construction, and many other features at only $89.50.

Finally, there's *the world's finest professional saw*—the all-new 8½″ Model 528 Speedmatic. *More* speed, *more* power—telescoping guard, exclusive Kickproof Clutch, calibrated depth gauge – and every conceivable feature of *quality* design and construction.

See these new professional quality saws at your Porter-Cable dealer's today—or write for full information *now*.

Model 157
Porter-Cable *quality* in a professional 7¼" saw with blade on left. Light in weight—only 13 lbs. complete. Ball bearing construction throughout—instant depth and bevel adjustments, telescoping guard, powerful 12 amp. universal motor, exclusive Kickproof Clutch—only $89.50. In handy kit with accessories, only $104.50.

Model 528 Speedmatic.
World's finest professional saw. Extra speed and power for extra-heavy duty—perfect balance for easy, all-day use. 8¼" blade with new telescoping guard and exclusive Porter-Cable Kickproof Clutch—new calibrated depth gauge, instant bevel adjustment, new handle design with built-in trigger switch. Full ball bearing construction for long, troublefree service. $130—in kit form with accessories, $145.

Special Introductory Offer on Model 146. Save $12.00 when you buy the rugged 6½" Model 146 Saw in handy kit form. Kit includes saw, rip guide, protractor gauge for all straight or angle cut-offs, and a strong steel carrying case. Regularly $87.75—now only $75.75! Offer expires July 30, 1956—See your Porter-Cable dealer *now!*

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Quality Electric Tools

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SAWS • DRILLS • SANDERS • ROUTERS • SHAPERS • PLANES
In Canada: write Porter-Cable, Ltd., Box 5019, London, Ont. Canadian prices slightly higher.

Rambler Is Small But Roomy, Say Owners

(Continued from page 111)

"My biggest surprise is the excellent ride compared to the heavy cars I have owned. It rides 100 percent better than my previous big car."—Pennsylvania salesman.

"Friends are overwhelmed at the quality of the ride."—Illinois general manager.

"Fine ride. Often when tired I pull to roadside, drop back the reclining seat and rest."—Texas retired owner.

Third best-liked feature, say Rambler owners, is its economy:

"I drive to work every day. Used to buy 18 gallons of gas a week, now I buy only 11 gallons."—Ohio labor representative.

"Gas consumption of 17 miles per gallon in city driving is outstanding. Much better than any other car I have owned."—Virginia federal worker.

"I drive only 5000 miles a year, mostly to work and the grocery. Wanted an economical car. To me, 200 horsepower is something for bull sessions only." — Ohio lithographer.

Most-Frequent Complaints

Nearly a third of the owners (31.3 percent) had no complaints to make about their 1956 Ramblers, but others did. The complaint most frequently mentioned was that the car failed to live up to its advertised gasoline mileage. It may get good mileage, but it doesn't get what the ads say it will, say 15.5 percent of the owners.

"They advertise up to 30 miles per gallon. I can't get 20 out of mine." — Oklahoma retailer.

"Fuel economy not what I was led to expect. Dealer informs me that the factory is not satisfied with mileage on early models and is replacing carburetors." — Anonymous owner.

"My '51 Rambler gave 28.6 miles per gallon at 55 miles per hour. My '53 Rambler gave 25.8 miles per gallon. My '56 gives 22.6 miles per gallon. Where is Rambler's economy going?"—California market owner.

Second most-frequent complaint was about the Rambler's dashboard design and arrangement:

"Driver has to reach too far for the cigarette lighter and has to reach under the steering wheel for ash tray."—California foreman.

"Glove compartment too small. I liked drawer style better."—Connecticut inspector.

"Knobs for heater and lights are apparently pressed on and come loose occasionally."—Pennsylvania consultant.

(Continued to page 226)

WEEDS CAN'T STOP YOU!

JOHNSON'S SILVER MINNOW

For Best Results Use Johnson's Pork Rind

100% Snag-proof, yet special weed-guard doesn't interfere with strikes. Casts like a bullet! Enticing action!

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World's Lowest Priced Car!

NOW—32 PAGE BOOK filled with photos, drawings, specifications, records, wholesale price, and Rider Agents plan if no dealer near you. Send 25c for book, or send $1 (refunded first order) for it plus actual operating book and service manual.

MIDGET MOTORS MFG. CO., ATHENS 1, OHIO

NOW—SHOPSMITH®

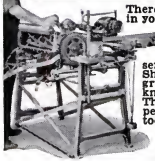
for as little as $3 per week

Start *enjoying* SHOPSMITH now for only $29 down, $3 weekly. Start *saving* now! Savings on projects and home repairs can more than equal weekly payments. See your hardware dealer or Montgomery Ward store. Write for 2 big, free, illustrated books.

SHOPSMITH, Dept. 322-B, Menlo Park, Cal., or Box 2000, Ft. Wayne, Ind.

Need an extra $1,000, $2,000, or more? Make it with an

IDEAL LAWNMOWER SHARPENER



There are thousands of lawnmowers in your locality: Average $1,000 profit per 250 mowers with customer satisfaction and repeat business assured. Provide this essential service with an Ideal® Lawnmower Sharpener, the only machine that grinds the reel to "fit" the bed knife. Compare by any standard. The Ideal, backed by 53 years of experience, costs no more. Write today for complete, free catalog.

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Performance Tested Fir Plywood Fleet Architect Designed

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*Use Only Exterior Fir Plywood For All Marine Construction

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Please send plans checked below. I enclose 25c for each. (Good in U.S.A. only)

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All American in name, performance and manufacture! H-I Spin Reels set new standards for quality, value and long, trouble-free service. Light weight—only 6 oz. . . . right- or left-hand operation, without interior adjustment . . . noiseless nylon gears, oil-less bearings . . . adjustable spool drag . . . anti-reverse button . . . handsome, long-lasting finish, with all fittings hard chrome plated.

Also a de luxe model 1903 ($15.00) especially balanced for super performance on glass rods.

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Rods, Reels, Lines, Lures, for every fisherman and every kind of fishing

Valuable Fishing Guide. Send 25¢ to HORROCKS-IBBOTSON CO. Dept. PM-626 UTICA, N. Y.

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Rotary Mower is only *one* of 21 tools . . . 5-HP Gravely Tractor does every lawn, garden, field job *easier, better*! All-gear Drive, Power Reverse. New "Power vs Drudgery" Booklet FREE! Write today . . . and ask about the NEW EASY PAY PLAN.

(Push-button Starter Optional Equipment)

* GRAVELY *
BOX 663 DUNBAR, W. VA.
FIELD-TESTED FOR 34 YEARS

"Clock is useless to driver."—Massachusetts railroad fireman.

Tied for third place on the complaint parade are two related faults of poor assembly work and water leaks (both were mentioned by 8.2 percent of the owners).

"Too quickly put together. Too many faults. Doors not watertight. Leak in fuel line. Hood does not close properly."—Indiana policeman.

"Body fits are rough and sloppy. Too much is left for dealers to do over."—North Carolina salesman.

"Water leaks around right-front door."—North Carolina housewife.

Reclining Seats

While only a small percentage of the owners state that they have slept in the Rambler's twin beds, most are enthusiastic about the reclining-seat design. Those who have slept in the bed were generally satisfied with it, although some complain that the beds are not long enough for the average-size man.

"We purchased the Rambler with a vacation in mind. We took a month's vacation in Florida. My wife and I slept in the car for 12 consecutive nights. We also like the restful reclining position of the seats."—Ohio mechanic.

"On a trip it sure is nice to put the seat back a notch."—California tileworker.

"Should eliminate the hump in the reclining seats when made up as a bed. It should be a little longer for a tall person."—California inspector.

"Some lock should hold reclining seats in place and prevent them from swinging forward on sudden stop or impact."—New York shipping director.

Like Bigger Car?

Originally, the Rambler was a chopped-off 100-inch-wheelbase two-door model that sold principally because it was a small car. Since then it has grown up and is now a 108-inch-wheelbase car less than a foot shorter than some other cars. It is built only in four-door models now. As it gets longer, it seems to become more popular. We asked the owners what they think about this trend. Most of them like it, 79.2 percent to be precise. When the figures are tabulated on the basis of previous Rambler ownership, the result is the same, but less emphatically. Among previous Rambler owners, 71.1 percent like the trend toward a larger car. Among first-time Rambler owners, the percentage of those who like the bigger car jumps to 84.6 percent. Rambler seems to appeal to more buyers in its bigger form.

(Continued to page 228)

THE ORIGINAL
PACKAGED BOAT KITS

Made ONLY by *Custom-Craft*

Top Performance, Design, Styling! Over 70 Models 8 to 21 ft

World's largest line! Over 200 Boats: Kits, Formed-Hulls, Semi & Custom-finished! All types: Proms -Cruisers! Easy to build! Flyingstern, Tredanic bottom, Bulkhead construction!

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52 pages: Includes Victory Series, hardware, paint accessories, Fiberglas! Send $1.00 for Catalog Plus "Boating Handbook". DEALERS-AGENTS INQUIRE

BOAT PLANS & PATTERNS Frame-Pac Kits

World's largest selection: over 200 plans, full-size patterns, frame-pac kits! Designed strictly for amateurs! All types: proms, kayaks, racers, runabouts, catamarans, houseboats, cruisers - inboard-outboard 6-40' wood-plywood-steel!

Send 25¢ for PLAN CATALOG

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NEW! Giant **AUTOMOTIVE CATALOG**

1956 Edition! Everything for car, truck, custom-styled car, hot rod . . . at LOWEST PRICES!

SAVE UP TO 50% on all parts, accessories! Only complete automotive buying guide . . . 75,000 items . . . 180 pages! Thousands of **hard-to-find parts; equipment, parts for 1920 to 1956 models; Hollywood accessories** never before offered; **hi-speed parts.** Send your name and address and 25c (refundable with first $5.00 order) to:

J. C. Whitney & Co. 1917 Archer, Dept. P-6, Chicago 16, Ill.

FIND HIDDEN RICHES!

NOW—find buried treasure, gold, silver, and metal objects, with sensational 3½-lb. locator—GOLDAK'S "FIND-IT" . . . only $49.50 complete with earphones, batteries, instructions.

Manufacturers of metal detection devices since 1933.

Write for FREE literature full line metal, mineral locators; geiger and scintillation counters.

GOLDAK CO. 1542 W. Glenoaks Blvd., Glendale, Calif.

BUILD FINE GRANDFATHER CLOCK NOW

The simple sensible **Red-i-Kut** way as thousands have — SAVE HALF. **SHOP TESTED PLANS "SPIRIT OF THE CENTURY"** Narrow waist 83" tall or stately straight side **"SPIRIT OF AMERICA." EASY-to-FOLLOW** *photopack* **PLANS** tell all—plus **BROCHURE** of heavy brass weight **Westminster** tube chime, **movements,** *gorgeous* bronze-silver dials, ¾" solid mahogany case kits. **Send $1.00 today—Both plans $1.50 NOW.**

Kuempel Chime Clock Works, 28 Kuempel Bldg., Minneapolis 16, Minn.

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5 Assorted Size Magnets $1.00. Powerful **Pocket Magnet** W/case **$1.00. Hot Pad Magnets**—large size **8/$1.00. Bulletin Board Magnets 8/$1.00. Slender Magnets**—pencil type **2/$1.00. Car Compass**—accurate, useful **$1.50. Retrieving Magnets**—extra power, heavy duty—30 lb. pull **$4.00,** also 50-75-100 lb. pull.

Explore, learn Electricity, Magnetism, Electro magnets, complete kit and instructions with 22 experiments and models. **$3.98**

Also — Rods, discs, bars, horseshoes. **Send stamp for catalog — Specify your requirements — 100% SATISFACTION GUARANTEED.**

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$40 for 1½ DAY'S SPARE TIME WORK GRINDING LAWNMOWERS

Yes, J. H. B. writes, "not bad for a 76 year old young fellow earning $40 for a day and a half's work" . . . and others are making even bigger money with the Universal Model B Lawnmower Grinder. You, too can make good spare or full time profits in your own business in your garage or basement. We furnish everything you need. Write today. No cost or obligation. Dept. M-66.

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Mail this coupon today! Get your FREE strainer.

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Portable & Piston Model
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Professional Quality at Popular Prices!
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For Painting, Spraying, Inflating, Lubricating, Cleaning . . . Model 1520 (illustrated) delivers more air than many models three times its size! Sealed ball bearings. No piston rings . . . no oil needed. Helps you do dozens of "everyday" jobs easier, faster, better, cheaper! Cuts down on repair bills for home, car, machinery.

Powered by Electricity, Gas Engine, 6 or 12 Volt Storage Battery. Regardless of the job, wherever you want to work, there's a Johnson Compressor to fit your exact needs!

Complete Line of Matched Accessories for Every Job. Free catalog illustrates 17 different compressors and all kinds of accessories . . . hose, spray guns, tire chucks, grease guns, mounting brackets, air gauges, blow guns, etc. For farm buildings, famous Insectospray attachment kills insects with push-button ease!

JOHNSON SERVICE COMPANY
507 E. Michigan St., Milwaukee 1, Wisc.

"Rambler was a bit small before. Now it is large enough and I hope they leave well enough alone."—New York draftsman.

"Okay if they stop now. The '56 is just right."—Michigan salesman.

"I bought it because it is now average in size. Hope they don't make it larger."—Wisconsin supervisor.

"Getting too large for me. Factory is defeating its original purpose."—Washington glassworker.

"Liked them better when they were smaller."—Pennsylvania machinist.

More Best-Liked Features

Here, in order of frequency of mention by Rambler owners, are more quotations describing best-liked features:

"Everywhere I park my car, people start touching it, walking around it and talking about it. It's a honey."—Oklahoma teacher.

"It has the highest H.T.P. of any car on the road (H.T.P. is head-turning power)."—New Jersey machine operator.

"Although styling played no part in my selection, the Rambler is distinctive. People crane their necks to look at it."—Washington, D. C., dentist.

"Has looks of a sports car."—Michigan maintenance supervisor.

"My wife is in love with the Rambler because it is easy to park."—Ohio contractor.

"People have been surprised at roominess of the interior. Small on outside, yet large inside."—Illinois laborer.

"Visibility good. No blind spots. Four front headlights very good for country driving as you can see ditches on both sides of road."—Illinois supervisor.

"Easy to handle in traffic with so much glass."—North Carolina hosiery worker.

"The only sensible car for the average family. Its 120 horsepower is enough. It cruises at 65 and 70 as well as other cars."—Ohio telephone operator.

"Good pulling power on hills despite only 120 horsepower."—Virginia supervisor.

"I like the fact that it is small."—California secretary.

"Hugs the road. Feels safe."—Tennessee tool designer.

"Best cornering car I have owned."—Pennsylvania industrial engineer.

"I like the unit body and frame."—Arizona cabinetmaker.

"Doors on this car never rattle."—Wisconsin salesman.

"Sold on antirattle feature of unit frame construction."—Michigan engineer.

"Rollbar above rear window is great safety factor."—Ohio machine operator.

"Heater gives quick heat." — Pennsylvania machinist.

"Compact layout of engine."—New Jersey machine designer.

"Easy to start at 20 below zero."—Michigan inspector.

"All-leather upholstery." — Wisconsin laborer.

"My fourth Rambler. I drive 40,000 miles a year and never had any major trouble."—California upholstery dealer.

And More Complaints

Fifth among the owners' complaints is the operation of the Hydra-Matic transmission, with 6.8 percent mentioning it. Next comes the poor quality of the radio, followed by body rattles (mostly in hardtop models). For a listing of percentages of these and other complaints turn to page 109.

Here are typical quotations describing complaints listed in order of frequency of mention by the owners:

"Hydra-Matic jerks too much when put in reverse."—Pennsylvania salesman.

"Hydra-Matic jumps out of reverse at times as you back up."—New York housewife.

"Very poor radio for price paid. Cheapest part of car."—New Hampshire owner.

"Body rattles more prevalent. Doors do not close tightly. Believe this complaint is peculiar to hardtop models." — Virginia builder.

"Paint job is very poor. Paint chipped in many places."—Connecticut accountant.

"Steering wheel too close to driver. Seat will not go back far enough."—Michigan architect.

"Should have light on Hydra-Matic indicator."—Michigan bus driver.

"Speedometer noisy, but manufacturer is supposed to replace later with plastic gear to cut out noise."—Illinois editor.

"Heater not all I thought it would be. Warm in front, rear floor cold."—Wisconsin salesman.

"Rubber hose connecting gas-filler neck and gas tank came loose on my car and 10 others delivered by my dealer. Water and debris got into tank, fuel lines and pump, causing two engine failures in traffic. Hard to take in brand-new car."—Virginia government worker.

"Window handle too far away and winds backward."—New Jersey night checker.

"Radio grille vibrates."—California communications specialist.

"Not enough clearance between body and rear tires for chains."—New Hampshire rural letter carrier.

"Have trouble with carburetor when going around right-hand turns fast."—Washington messenger.

(Continued to page 230)

Just what paste wax needed - a built-in cleaner!

Johnson's J-Wax new Paste Wax Discovery does the cleaning work for you!

LONG-LASTING WAX KEEPS FRESH AND EASY TO APPLY IN THIS NEW KEY-OPENING CAN

Start right in waxing! No extra cleaner needed—nothing else to buy!

Here's what you've been waiting for—a paste wax with a cleaner built right in! Johnson's new J-Wax saves you hours of pre-cleaning. J-Wax takes the dirt off for you—replaces grime with a crystal-clear coating of wax. Even the dirt you can't wash off loosens instantly and disappears as you rub on this new self-cleaning paste wax.

Then watch the high brilliant luster that comes as you buff. J-Wax sets smooth and hard—bonds itself into a long-lasting wax-tight seal. Gives your car tough wax protection it needs for any weather. And look! The colors are far brighter, truer—even the chrome glistens.

Get your car ready now for the months ahead—with J-Wax. It's the easiest, fastest way to genuine wax protection—*paste wax protection!*

Extra-Handy

...and tough all the way through!

RIDGID

the easy-to-use Bench Pipe Vise

Look at the *more* you get for your money . . . built-in pipe rest aids accurate threading, handy pipe bender . . . Lon-Grip tool-steel jaws hold pipe firmly without chewing it up . . . yoke and base of special last-a-lifetime malleable . . . a bargain in quality!

Buy your RIDGID Pipe Vise at your Hardware Store!

RIDGID Chain Bench Pipe Vise—5 sizes to 8" pipe.

RIDGID
Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U.S.A.

"Putting shift into first gear there is always a grind even though clutch pedal is all the way down."—Illinois salesman.

There you have it, the digest of the thinking of hundreds of Rambler owners. For an engineer's analysis of the car turn to page 108. For Floyd Clymer's driving test turn to page 107. ★ ★ ★

Clymer Road Tests The 1956 Rambler

(Continued from page 107)

advantage—a more rigid rear-end assembly that assures constant alignment of rear wheels.

I found less tendency for the front end to nose-dive than most cars when the brakes are applied quickly.

Economy and high performance do not go hand in hand, but in the Rambler the owner will find a happy medium. Its economy certainly is unequalled by any other American car. The large gas tank (20 gallons) enables the Rambler to go long distances between fuel stops. Starting with a full tank, I drove 432 miles before the tank ran dry. This included city driving in Los Angeles and San Diego plus moderate highway driving on long, open stretches. The average was 21.6 miles per gallon, certainly not bad for a station wagon. Regular gas is satisfactory.

Surprising Speed

Speed was also surprising. The speedometer showed a top of 96 miles per hour, although, like most cars, the speedometer is fast by at least six percent. It is a fast highway car and surprisingly high average speeds can be maintained without undue effort or fatigue. Body rumble at high speed was slight, indicating good insulation.

Brakes are excellent. Pressure is light and smooth. There was little evidence of fading, even when descending steep hills or stopping from high speeds.

Rambler a Safe Car

In my judgment, Rambler, though smaller, is safer than many cars. The welded, unitized body-frame construction offers above-average protection in collisions. It also reduces rattles and squeaks. None developed in the test.

Rambler is the lowest-price car to offer Hydra-Matic. The test car had it. Standard transmission, with or without overdrive, is also available.

Hydra-Matic has two driving ranges. For normal use in Range 4, a kickdown for fast acceleration takes place up to 58 miles per

(Continued to page 232)

IDEAS FROM WELDWOOD

THIS MONTH'S PROJECT – LAWN CHAISE

Here's the way to soak up the sun in style! This form-fitting chaise is extra comfortable and so easy to build. (See coupon for Easi-Bild Pattern*.) It's a handsome addition to your lawn furniture . . . and even comes apart for easy storage or for carting to the beach. You'll find it's a good idea to build two of them . . . because they'll be in demand all summer long.

And you'll find it's an extra good idea to make your chaise with either Weldwood exterior plywood or with amazing new Weldwood Duraply®. New Duraply is easy to work, gives you clean edges. And Duraply has a special tough facing that will save you paint. Needs no priming coat! Two coats on Duraply's super-smooth surface actually give the same coverage as 3 coats on ordinary wood. And the paint will stay new-looking longer. The overlay face is completely weatherproof, too. You'll have no fear of the rain damaging your chaise.

*T. M. Reg. Easi-Bild Pattern Co.

The Weldwood Question Box

Q. I want to finish off a playroom. How do I go about putting wood paneling over a concrete-block wall?

A. First make sure walls are dry and no moisture problem exists. Then put up your furring strips (1" x 2" pine)—horizontal ones every 16"—vertical ones every 4'. Vertical strips should be placed so the joints of the paneling will fall on them. Use wooden shims behind furring where needed to make all the furring strips even. To attach furring strips to concrete block, use anchor bolts or cut nails. After furring is in place, nail the paneling right to it—or better still, use Weldwood Contact Cement and avoid nail holes in the wood face. Leave about ⅛" space between bottom of panels and floor, for air circulation.

Q. Planning on painting some fir plywood. How can I keep grain from showing through?

A. That's simple. Prime the plywood with a coat of white Firzite. Firzite is specially designed to seal wood pores and help tame unsightly grain. Sand lightly, and apply finish coat. Use white Firzite as an undercoat for paint or enamel. For varnish or stain finishes use clear Firzite.®

HAVE A QUESTION?

Send it to "The Weldwood Question Box," 55 West 44th St., N.Y. 36, N.Y.

This Month's Hints

1. Putting on addition on the house? You can save time and trouble with Weldwood fir plywood for sheathing, subflooring, and roof-decking. Plywood makes a very strong and rigid structure . . . goes up fast . . . holds nails well . . . and there's almost no waste.

2. Screws put into the edge of a piece of plywood should be just long enough to take a ¾" bite into the wood. Shorter screws won't hold securely enough . . . longer screws won't add much, if any, strength to the joint.

$10 for your ideas

for "This Month's Hints", if accepted for publication. (Hints *must* apply to same Weldwood product.) Send them to Weldwood Hint Editor, 55 West 44th St., New York 36, N. Y.

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Weldwood—The Best Known Name in Plywood

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P. O. Box 215, Pleasantville, New York

Enclosed find 35¢ for which please send me Pattern #324—Lawn Chaise. PM6-56

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Here's Power and Performance that's hard to beat

If you want power — plenty of power — then you'll like Millers Falls Dyno-Mite Electric Drills. They're light, compact, perfectly balanced — and they pack a punch that's way beyond their size.

You'll like the looks of these shining beauties, too — mirror polished to glistening silver sleekness. Most of all — you'll like the rugged quality that guarantees years of trouble-free service.

Illustrated is the ¼" No. 1814 Drill, one of the *complete* line of Dyno-Mite ¼", ⅜" and ½" drills. In addition, Millers Falls offers the broadest range of attachments and accessories available today—including the remarkable, high-speed Dyno-Mite Power Bits shown with drill above. See — try — buy them at your dealer's.

Dyno-Mite Jig Saw Attachment for ¼" electric drills. Cuts straight lines, circles, any shape. Capacity: 1¾" in wood, ⅛" in metal. Comes with 4 blades. No. 2140 ..... $10.95

Buffing and Sanding Attachment. Fits ¼" electric drill. Complete with 5" Rubber Pad, two 5" Sanding Discs, and a 5" Lamb's Wool Bonnet. Two speeds. No. 2120 ..... $8.45

Millers Falls

Finest Power Tools Made

MILLERS FALLS TOOLS SINCE 1868 ®

FREE FOLDERS on the complete line of Dyno-Mite Power Tools, including the amazing new Dyno-Mite Power Workshop. Ask for them at your dealer's or write:

MILLERS FALLS COMPANY, Dept. PM-14, Greenfield, Mass.

hour if the throttle is floored. Final upshift with floored throttle takes place at about 65 miles per hour. In Range 3, desirable in traffic or hilly country, there is no upshift into high.

The Rambler engine is started by lifting up on the gearshift lever to engage the starter switch.

The car has many exclusive and excellent features. The doors have dual sponge-rubber seals around the windows, affording a water and dust-proof joint. No dust leaks appeared on dusty back roads. No water leaks resulted during a water test.

Improved performance has resulted from the overhead-valve design of the new engine. It has the smallest displacement (196.6 cubic inches) of any American car except the Studebaker Champion. Rambler does not offer a power pack.

The engine has little vibration at any speed and is extremely smooth under all conditions. Even at high speeds over desert roads or during miles of low-gear use over sandy trails no heating occurred.

The driving position is comfortable for the short or medium-height driver, but legroom is short for the six footer. The armrest is too high for the tall person. Headroom is satisfactory. Doors open and operate easily and have a solid feel. Squeeze-type door handles now operate better than on earlier models. Window cranks require only two turns to open or close the window and they turn easily. The location of the window crank, however, is too low; it should be higher on the door.

Interior Is Good

The interior is well finished. All instruments are grouped in the small panel directly in front of the driver. A full-circle horn ring is used but does not obstruct speedometer vision. The shift-lever quadrant is right in front of the driver. Heater controls are on the left side of the steering column.

A needle temperature gauge is used with warning lights for oil pressure and generator output. Two plain but practical radio dials are in the center of the cowl. Except for some spots in the desert, radio reception was good. A small, bin-type glove compartment is in the center of the dash.

The brake pedal is high in relation to the throttle and could be wider. The parking-brake lever is far forward and should be closer to the driver.

Bumpers are of moderate size with good wrap-around protection. They are practical and have no projections. The license-plate mount is in the center of the front bumper and is the first point to hit another

(Continued to page 234)

Some spark plugs are designed for low speeds . . . some spark plugs are designed for high speeds . . .

Only new POWER TIP "fires up" your engine at all speeds!

No more need for old-type plugs in modern engines. In the past, you had no choice but to use conventional type spark plugs in your modern overhead-valve engine. You had to choose between "hot" or "cold" plugs depending on whether your driving was mostly at *low* speeds or *high* speeds.

Now new POWER TIP—one plug for ALL speeds! Here's the difference. Projecting center electrode and ceramic tip—the POWER TIP—extends the spark gap in toward the center of the combustion chamber. It operates *hotter* at low speed—resists fouling because deposits burn away clean. Yet the Power Tip takes advantage of richer intake gases in high-speed, wide-throttle driving—runs *cooler* and checks pre-ignition!

Available now for all these cars with overhead-valve V-8 engines using 14 mm plugs: Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Plymouth, Ford, Hudson, Imperial, Lincoln, Mercury, Nash, Oldsmobile, Packard, Pontiac, Studebaker.

AUTO-LITE RESISTOR SPARK PLUG WITH **POWER TIP**

Auto-Lite manufactures over 400 products, including Spark Plugs, Batteries, Wire and Cable, and Automotive Electrical Systems . . . sold throughout the United States and Canada.

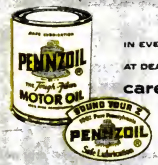
Sound your Z...expect

PICKUP FOR KEEPS

because—

Pennzoil with Z-7 keeps engines clean

Trust your engine to Pennzoil with Z-7 and you can count on that extra burst of power when you need it! This different Pennsylvania motor oil with an all-oil body controls carbon and other deposits completely . . . prevents power-stealing knock and ping. By keeping your engine clean and smoothly responsive, it keeps horsepower unlocked—not for just a few miles after an oil change, but for keeps. To pass safely or flatten the hills, just sound your Z for Pennzoil with Z-7, The Tough-Film® oil, in the exact seasonal grade for your car!



IN EVERY STATE,
AT DEALERS WHO
care FOR YOUR CAR

MEMBER PENN. GRADE CRUDE OIL ASSN., PERMIT NO. 2, OIL CITY, PA.

bumper. Designers seem to think a thin, metal license plate needs no protection. It does, though.

Headlights are mounted within the grille, closer than on conventional designs. Smaller running lights are in the front ends of the fenders and operate whenever the headlights are on to show car width.

Rambler has a very practical rear door in its station wagon. The window cranks down into the tailgate. When the gate is lowered, there is no upper transom to obstruct loading or to bang your head on.

Vision in every direction is excellent. The short sloping hood provides a good view directly forward.

Of course, the reclining-seat and twin-bed features are continued in the new Rambler. ★ ★ ★

Talking Directory

Shoppers in a Whittier, Calif., supermarket are told where to look for grocery items by a "talking directory." When a shopper pushes one of the 96 buttons on a directory panel, a tape-recorded voice tells where the selected item is located and may add a plug for a related item or for the special of the day. Seven duplicate panels, each with a self-contained loudspeaker, are connected to a master tape recorder. A "stand by" sign on the panel lights up when someone at another location is using the system. When the unit goes into production, 10 duplicate panels each with 144 selections will be possible in one system.

Win

3-country expense-paid

Grand Tour of Europe

for 2** in the **WEPCO

wonder-trip contest

fly via ***PAN AMERICAN WORLD AIRWAYS***

99 OTHER PRIZES

2nd to 5th Prizes: Week's vacation for 2 in Bermuda.

Plus 95 Wepco Product Prizes.

Nothing to Buy! Get Free Entry Blank From Your Lumber or Hardware Dealer! Contest Ends June 30th.

KANGAROO *Self Storing* COMBINATION DOOR

Only door with its own self-storage compartment. Screen or storm inserts are stored inside bottom panel, always ready for use. Rugged, extruded aluminum construction.

NEW WEPCO adjustable aluminum window awnings $15.95 & up. Slightly higher in some areas.

DUO-MATIC 3-track, self-storing extruded aluminum combination window as low as $15.95.

DUO-DOR extruded aluminum combination door. $39.95, 6 standard sizes. Slightly higher in some areas.

Wepco Products Are Sold Only At Dependable Lumber and Hardware Dealers.

Guaranteed by Good Housekeeping

the weather-proof co.

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H-W-R stops hydraulic lifter noise . . . keeps your engine clean, restores power . . . gives smoother, quieter performance . . . rids automatic transmission of jar and jerk. Results guaranteed or *Double-Your-Money-Back!*

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HASTINGS

Buy these Hastings Products with confidence:
H-W-R, Casite, Piston Rings
Oil Filters, Spark Plugs

Lightning Plays Queer Pranks

(Continued from page 69)

vanish or jump to another point on the line. No sensation was experienced on applying the tongue to the line[!]

"Meanwhile the cups of the anemometer, which were revolving rapidly, appeared as one solid ring of fire, from which issued a loud rushing and hissing noise. Our stone chimney was a flaming arrow. . . . On placing my hands close over the revolving cups of the anemometer, I did not discover the slightest sensation of heat, but my hands instantly became aflame. On raising them and spreading the fingers, each of them became tipped with one or more cones of light nearly three inches in length. The flames issued from my fingers with a rushing noise accompanied by a crackling sound. The wristband of my woolen shirt, as soon as it became dampened, formed a fiery ring around my arm, while my mustache was electrified so as to make a veritable lantern of my face."

Such hair-raising experiences are examples of the weird effects of St. Elmo's fire and lightning. Nature may have a chuckle or two hidden in the black depths of a thunderstorm. ★ ★ ★

Plastic Patching Stick

Heat from an ordinary clothes iron melts a plastic-metal stick which fills dents in auto fenders, wood and other materials. Two two-ounce sticks are equal to one pound of solder, and no tinning or flux is needed. The patch can be sanded, polished and painted, and will withstand heat up to 265 degrees Fahrenheit.

New!

Leader Material

on

COLOR-CODED SPOOLS*

* Pat. Pend.

NEW! HANDY BUILT-IN CUTTER

25c each

Distinctive color for each line weight—no guessing. 2 to 20 lb. test Deceiver® Monofil Nylon.

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$39 up–FREE FREIGHT

SAVE 2/3!

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19' CRUISER KIT $499.50!
SEND 10¢ for KIT CATALOG!
Includes Hardware
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Build over 50 modern boats from large scale plans, available with FULL-SIZE patterns, new PRE-FAB frame kits! All types: prams to cruisers, 6 to 25 ft. Best buy for Amateurs! SEND 10¢ for CATALOG.

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Cards, Stationery, Advertising, Circulars, labels, photo and movie titles, church work, tags, etc. Save money. Sold direct from factory only. Raised printing like engraving, too.

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Print for Others, Good Profit. Have home shop. Junior press $16; Senior $29 up. We supply everything. Easy rules. Pays for self in short time. Write for free catalog of outfits and all details.

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SAVE MONEY ON YOUR COMPRESSED AIR

buy this complete
SMITH 45-P air compressor

Right for spray painters, plumbers, contractors, monument shops, tire changing trucks, maintenance shops, quarries, utilities, many other users. Delivers 45 plus cu. ft. per minute; pressure up to 150 PSI. Powered by Wisconsin 4-cyl. air-cooled engine; uses less than 1 gal. gasoline an hour! Most compact, biggest-value compressor for its capacity anywhere! Other models to 230 cfm.

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$4.95

ROWE'L-EZY

(Say Roll Easy)

ALL PURPOSE LAWN and GARDEN EDGERS

It's down-right easy to do a clean, fast, effortless job of edging along sidewalks, flower beds, stepping stones, trees, fences and walls with a Rowe'l-Ezy, "Rotary Lawn Shear."

The patented trouble-free shearing action combined with top-quality materials and workmanship assures you of easy edging with Rowe'l-Ezy.

Close Coupled $3.95 Two-Wheeler $5.95

At all Hardware
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LOOK FOR THIS LABEL
IT IS YOUR GUARANTEE OF QUALITY

ROWE TOOL CO., Box 3185, Glendale, Calif.

YOU SAVE $10 to $20...

(smaller saws cost that much more!)"

NEW! 6½" POWER SAW

with exclusive Automatic SAFETY CLUTCH increases work life up to 15 times!

says Fred Wiborg, Master Carpenter of Chicago

only $49.95

This new Pet saw is packed with power . . . . a husky 1 horsepower. And Pet's exclusive Automatic Safety Clutch eliminates dangerous kick-back, motor burn-outs from overloads. Increases saw life up to 15 times!

And what a price! This all-new Pet 6½" saw costs $10 to $20 less than other top 6½" saws!

Fred Wiborg (above) says, "I job-tested this Pet saw on the roughest, toughest work I could find . . . and it came through like a thoroughbred. Cuts a 2 x 4 at 45° in one cut! And you should see the report on it by a famous research institute. Proves that this Pet saw equals or excels any other make, *regardless of price!*"

Automation is the secret of its amazing low price—JOB-TESTING is the secret of its heavy duty performance. See it tomorrow for sure!

NEW!

- 1 h.p. Universal ac/dc motor develops 4850 r.p.m.!
- Exclusive Tru-Guide for right, left or on-line sawing — stops guesses!
- Exclusive Automatic Safety Clutch adds up to 15 times more work life!
- Comfort-engineered Handi-Grip for easiest working angle!
- Retracting lever on automatic blade guard!
- Easy grip knobs adjust all saw positions instantly, effortlessly!

Those who depend on their tools depend on

JOB TESTED

PET POWER TOOLS

PORTABLE ELECTRIC TOOLS, INC.

Chicago 20, Illinois

6-Transistor Superhet Portable

(Continued from page 148)

settings of the i.f. transformers are fairly close to the correct i.f. frequency (455 kc.) the receiver can usually be aligned by ear. However, a noise generator, rather than an actual signal, should be used to do this. A fluorescent light or electric shaver can be used as a noise generator.

To align the set, temporarily connect a long, flexible wire to the r.f. stator lug of the tuning capacitor and throw the other end of the wire over the noise generator. With the generator on, adjust the i.f. transformer slugs, through the bottom of the chassis, for maximum noise. The receiver volume should be turned down so that a small change in noise is readily perceptible.

Tracking adjustments: Adjust the receiver for proper tracking, as follows:

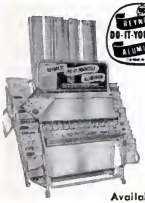
1. Tighten the oscillator and r.f. trimmer capacitors (see Fig. 2) and then open each approximately one half turn.
2. Cut out the dial scale on page 146 and tape it to the chassis and speaker frame so that the tuning capacitor shaft protrudes through the hole in the scale.
3. Attach a pointer knob to the capacitor shaft so that the pointer indicates the beginning of the scale with the capacitor plates fully meshed.
4. Set the pointer to the dial number corresponding to the lowest-frequency station in your area and adjust the slug in the oscillator coil until that station is heard.
5. Rotate the tuning capacitor until the knob points to the dial number of the highest-frequency station in the area and adjust the oscillator trimmer capacitor until that station is heard. Adjust the r.f. trimmer for maximum volume of the station.
6. Repeat steps 4 and 5 until no more adjustment change is required to tune in both end-frequency stations at the correct dial settings.

Tracking test: To determine if the receiver is tracking properly at the low-frequency end of the dial, set the tuning capacitor to a frequency slightly above that of the low-frequency station, and readjust the oscillator slug until the station is heard at this new setting. If the station volume is higher at this new setting than it was at the correct one, some of the loop-antenna turns must be removed. This is done by exerting a slight pull on the white antenna lead. Remove the turns one at a time until maximum station volume is obtained when the oscillator coil is readjusted to bring in the station at the correct dial setting. Then, repeat steps 5 and 6 described under tracking adjustments.

(Continued to page 240)

Make it of Aluminum... the metal that lasts ...outdoors

It never rusts, rots or warps...



Available in Canada

Aluminum is at its best out-of-doors. Strong and rust-proof, it stays new in looks and performance. Its light weight makes it easy to handle or move about.

And when you use Reynolds *Do-It-Yourself* Aluminum there are extra advantages. You work it, easily, with just woodworking tools. Most jobs are well started for you because Do-It-Yourself Aluminum comes in pre-formed sheets (8 kinds), in tubes, bars, fittings, rods and special extruded shapes.

Use it outdoors this summer for trellises, downspout extensions, patio windscreens. In minutes you'll make driveway markers, hose or tool racks. And Do-It-Yourself Aluminum is the one material for making a screen house or screening a porch.

At hardware and lumber dealers. Call Western Union Operator 25 for the name of the one nearest you.

REYNOLDS *Do-It-Yourself* ALUMINUM

By the makers of Reynolds Wrap

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See "FRONTIER," Reynolds exciting dramatic series, Sundays, NBC-TV

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CONVERT YOUR POWER LAWN MOWER TO A "RIDING" MODEL

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Ask your dealer about BREWER-CYCLE. This low-cost attachment converts your small power lawn mower to a "rider." Just detach mower handle, secure BREWER-CYCLE with nuts and bolts — start riding! Works with old or new equipment. Write for dealer name.

Brewer-Cycle

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NEW!

P & C ®

HANDEZE Plier Grips

- PROTECT YOUR HANDS
- STRENGTHEN YOUR GRIP
- REDUCE HAND FATIGUE

Hard jobs are a snap with P&C Handeze Grips. You work faster, more efficiently. Made of smooth, comfortable blue vinyl plastic in three sizes to fit easily on practically all pliers. If you use pliers, you need P&C Handeze Grips. Buy them today!

Shop from colorful P&C tool merchandisers, in more than 10,000 stores coast to coast. Send 10c for big tool catalog.

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Patch gutter leaks in 15 minutes

Simply wire brush or sand around the hole. Apply flux. Clean and flux underside of copper patch. Tin both patch and gutter by heating solder with Bernz-O-Matic® Torch. Then place patch over hole and heat with torch until it sweats on.

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Repair jewelry in 5 minutes

Place TX-400, small soldering accessory tip on TX-10 Torch and "tin." Clean area where metal is to be joined with emery cloth. Use acid and solder with Bernz tip providing heat that "flows" solder between joints.

NOW SAVE $3.41!

GET A BERNZ O MATIC® TX-80

UTILITY TORCH KIT

This low-priced, big value Propane Torch Kit, a $10.90 value only $7.49

Includes Bernz-O-Matic Torch with pencil-burner head, plus utility burner head, plus soldering tip attachment and a box of Kester solder—a regular $10.90 value, now only $7.49 at your hardware dealer's today. Torch alone only $6.95.

Jobs illustrated and others are in the Bernz-O-Matic "Do-it-yourself" book. To get your free copy write:

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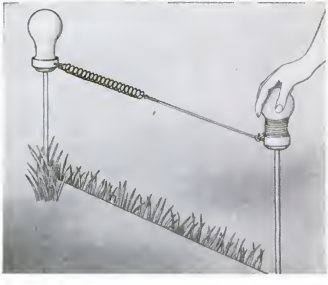
Making the carrying case. The carrying case can be constructed by making a frame of ½-in. lumber, just large enough to house the receiver, using two pieces of ¼-in. plywood for the front and back. The receiver itself can be used as a template for determining the exact locations of the speaker and control cutouts (see Fig. 6). The two battery holders are fastened to the back cover with ¼-in. wood screws (flathead), and a couple of flexible plastic strips are mounted on the frame to hold the loop antenna away from the speaker frame. Better drill two holes in the frame to coincide with the trimmers on the tuning capacitor since these must be readjusted for best results after the antenna is properly positioned.

A professional appearance can be given to the case by painting it, or by covering it with decorative plastic laminate. This material is available from hardware stores in many different patterns and designs. It is self-adhering to any smooth surface. For better adhesion, however, the case should be covered with a coat of varnish and the laminate applied before the varnish has completely dried.

The two screws in the top speaker holes are used to fasten the receiver securely to the cabinet. These screws can be countersunk in the front panel. A piece of grille cloth glued or stapled to the inside of the case, over the speaker hole, protects the speaker and adds the final touch to the finished appearance. ★ ★ ★

Garden Guide Line

Keeping your garden rows straight and edging lawns and driveways is easy with this new guide line. Two rust-resistant zinc-plated rods topped by bright-red knobs support the line. One of the knobs mounts a coil spring that keeps up to 25 feet of yellow mason's cord taut. If a hoe hits the cord it snaps back into place.



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Rated 1 H.P.—100 amps., 5600 R.P.M., 12 volts, D.C.—This double shaft motor of ball-bearing construction may be run on 6 volts for lower horsepower requirements—Standard 56" shaft, flange mountings—Dimenations: 9"x4½"x6½". Shipping wt. 19 lbs. A real value at..... **12.50** F.O.B. Chicago

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FOR: ● Reamer Drives ● Midget Cars ● Feed Mills ● Canning Machines ● Conveyors ● Lathes ● Milling Machines ● Motor Boats ● Cream Separators ● Garden Tractors ● Pumps.

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4, 1/2, 3/4, 1 H.P. Shafts 5/8" diam. Input rotation counter-clockwise facing shaft. Input speed 750 R.P.M. Size 7½" x 11½". Output rotation reversable. Shpg. wt. 31 lbs. Complete with 2 qts. of oil and full instructions.
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ITEM #126 — Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. ¾" pipe thread inlet and outlet. ½" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10½ lbs. AN OUTSTANDING BUY
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(Note — tubing not supplied)

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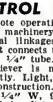

ITEM #384

These all bronze Centrifugal pumps are ideal for use as marine bilge pumps, circulating pumps, fire protection or irrigation, car-washing, dewatering, basement sump pumping, lawn sprinkling. Will pump water, oil, brine, gasoline, DDT and spray compounds. Equipped with 6" adjustable "V" pulleys, 2" dia. inlet and outlet, 180 GPM capacity, inlet and outlet take hose with 2¼" inside diameter. Dimensions 11"x8"x11".

Total head-feet	Speed	H.P.	GPM
25	3600 RPM	3	180
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20	2400 RPM	1¼	75

Back plate may be rotated for most convenient inlet position. Shipping weight 41 lbs. Govt. cost $96.00. F.O.B. Chicago..... **29.50**

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IDEAL FOR WELDING GENERATOR

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Ideal for powering electric tools, oil burner, refrigerator, lights, or other appliances requiring up to 700 watts of power. **700 WATTS**, 115 Volts, 60 cycles A.C. 3600 R.P.M. Compact, self-regulating generator with V Belt pulley and double outlet receptacle. Rotation counterclockwise. May be driven by tractor or auxiliary gasoline engine. Requires 2 HP minimum. Dimensions: 10" long x 8" high x 6" wide. Shipping wt. 27 lbs.
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Model 1010 — 1000 WATTS (Same as above) **79.50**
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2000 Watt Generator..... **149.50**

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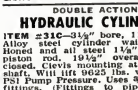

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On the Trail of the *Spray*

(Continued from page 81)

And, after watching this canny craftsman at work on the boat of his dreams, you know instinctively that all will be right, before he ever sets sail for the open sea.

I came upon Bob first when he was shaping up the oak keel of his sailboat, on the dirt floor of the shed. A year before he had gone into the forest nearby, selected a fine white-oak tree, 20 inches or so at the butt and 30 feet in the clear, felled it, and drawn it with his horses to the shed to dry. Now he was starting work on it. There he stood, astride the huge log, adz hung loosely between his knees, slowly chipping the round sides down to a flat surface some seven inches wide by nine inches deep. It was the kind of picture you see in a museum. But here it was 1955, and here was a very real, live person, quietly nibbling his way through inches of tough oak to form a single piece which was just one of the vast hundreds that were yet to be fitted together, before his creation could be called a boat.

How Can One Man Do It?

How could a man, who had served some eight years in the Navy and merchant marine, where he had used all the latest mechanical equipment, have the courage to undertake a task of this size with only hand tools and no outside assistance? How could he not only work the tremendous oaken timbers into their required shape, but have the strength to handle them?

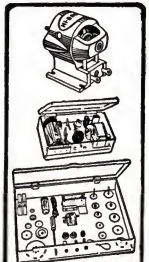
I found the answers to these and many other puzzling questions when I got to know the unusual Bob Carr. Here is a man who would rather have lived 100 years ago than today. Here is a man who knows and appreciates the craftsmanship that went into our boats and sailing ships of a century ago, when America's clipper ships were the fastest and finest vessels afloat. Here is someone for whom the age of steam destroyed the most fascinating era of sail that our country has ever known.

Bob Carr is a person who revels in using the God-given strength and brains that were passed out to him some 39 years ago. He loves to figure out difficult problems connected with the building of a boat, like how to bend the four by four-inch oak timbers into the sweet curves of the hull, or how to keep a piece of 10 by 10-inch wood from checking. It takes longer to do things by the brain and brawn method, he will admit, but it produces the greatest possible satisfaction.

His only concession to modern methods

(Continued to page 244)

ELECTRIC MOTORS & KITS FOR EDUCATION AND ENTERTAINMENT



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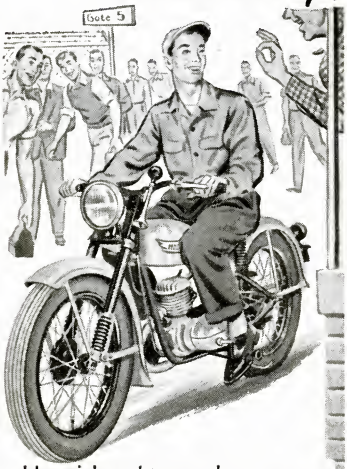

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was to let the sawmill rip out the planking, decking and some of the three-inch-thick oak for the boat. Everything else was cut and formed by him with his own hands. Occasionally, when he was handling some extra-heavy or bulky item, his mother would come out of the farmhouse nearby and help by holding the end of a line, or by taking up slack on a block and tackle. The rest of the time he has gone it alone.

Later I watched him working on the heavy white-oak stem piece, sided 7 inches and molded 10 inches, bringing it down to within ⅛ inch of final size. It was perhaps the sturdiest stem I had ever seen in a 36-foot boat and to my eye it seemed heavier than necessary. I asked him about it. For his answer he referred me to an incident in the life of the original *Spray* which carried the identical size stem piece. "One day in the Keeling Islands," her master stated, "she got in too near shore and split a coral patch in two, without even a blemish to her oak stem." That was good enough for Bob Carr; he was making his craft just like the *Spray*.

Construction Is Conventional

Actually, the construction of *Sirius* follows conventional boat-building practice very closely. After completing the stem piece, keel and transom frame, they were set up, plumbed and fastened together with galvanized bolts. Deadwood, knees and floor timbers went in next, and the backbone of the ship was in place on the little shop floor. All the timbers were treated with rot preventive. Before bending his frames, it was necessary for Bob to build a set of 12 molds, or temporary forms, outlining the shape of the hull. These, mounted on the keel at three-foot intervals, gave the shape for the frames, which were of three by three-inch white oak, spaced one foot apart. As each was put in, it was nailed at the keel, and fastened with three bolts to the floor timbers, which in turn had been bolted to the keel. Red lead was applied generously to all fastenings. When all were in place, three longitudinal stringers of good two by six-inch Vermont white oak tied the whole vessel together longitudinally between keel and the three by four-inch sheer clamp, on the upper inside hull edges.

After the deck beams and bulwark frames had been let in, Bob started on the hull planking, cut from 20-foot lengths of 1½-inch-thick long-leaf yellow pine. The planks were cut from clear 14-inch-wide boards, the finished width averaging about five inches after they had been shaped to the necessary curve. Each was fastened with galvanized nails to the frames, bolted

(Continued to page 246)

8" TILT ARBOR POWER SAW

NOW ONLY

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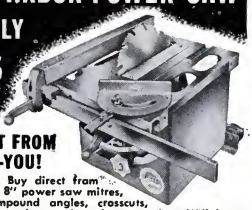

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at both ends, countersunk and the holes plugged. Bulwarks went in next, followed closely by the decking of 1½-inch oak and yellow pine. The transom was planked, the cabin built and the cargo hatch roughed in. Meanwhile all the spars had been formed from native spruce, each oversized in keeping with the heavy construction of the original *Spray*. The mainmast itself looked stout enough to stand if the shrouds should be carried away. And so month after month went by, each filled to the brim with careful, loving labor until now the *Sirius* has progressed to a point where she is almost ready for launching.

To have been able to fabricate a boat of this size in this workmanlike fashion speaks well for its builder. No finer ships than the *Sirius* are being built today.

Man of Many Skills

Carr is not only able to work in rough wood like the old-time craftsman, but his skills include those of an expert sailmaker, ironworker, rigger and cabinetmaker. With the same hands that swing the adz so adroitly, he has sewn two complete suits of sails for *Sirius* of number 6 and number 9 canvas, as well as a storm sail and sea anchor; and forged out the ironwork for her rigging on a small hand forge behind the barn, including the martingale, travelers, collars, wyes, chain plates, spreaders and stays. He has fabricated the beautiful steering wheel with its inlaid wood; made the pulley blocks, deadeyes, rudder, booms and masts. Each bears the imprint of the craftsman. With a lever, he moves great weights single handed. He knows how to steam-bend the stoutest oak to make it do his bidding; knows what makes one nail stay in a board, and another pull out. Instinctively he feels the proper balance in everything. He can tell you just how far the *Sirius* will heel under a strong breeze, before she brings up short, although he has never sailed in her. He knows the compass by heart; can navigate his own ship; shoot the sun and stars and plot his position anywhere in the world; knows what he is going to do if he gets into a hurricane; how to cook, and live on survival rations if he has to; reads a chart as you or I read a road map.

Perhaps, in days to come, Bob Carr, sitting at the helm of his ocean cruiser, may find himself on the selfsame course that Captain Slocum sailed with the *Spray* so many years ago. There will be one difference between the two, however. Bob is not taking along a supply of carpet tacks to spread on the deck at night, to keep inquisitive island natives from coming aboard while he sleeps. ★ ★ ★

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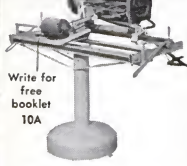

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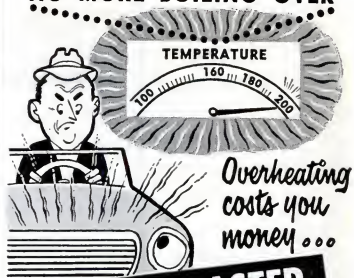

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Most Valuable Player . . . the Catcher

(Continued from page 95)

At the instant you hear the ball bloop off the bat, reach up and remove your mask but *hang onto it.* Spot the ball in the air, then toss the mask in the opposite direction so you won't stumble over it. In going for any foul, *turn your back to the plate* and play the ball over your head, catching it at arm's length. In this way the ball will curve toward you. Never walk or run backward to catch a foul.

Another thing you'll soon sense is that right-hand batters always tend to foul an outside pitch to your right, an inside pitch to your left. Just the opposite applies to left-hand batters.

In the case of popups, run out in front of the plate but again play the ball over your head.

Yogi, Campanella and the rest emphasize one point: *Don't watch a high fly ball constantly!* If you do you'll start swaying and losing your balance.

Throwing to bases. If you can't keep the runners from advancing you'll soon be riding the bench. Let just one runner take an extra base, and that steal may also steal the game. Always be alert for the steal or the hit-and-run. In throwing to a base, take a short step forward with the left foot, skip once, then throw overhand from behind the ear and aim *inside* the bag and a foot or two off the ground. Ignore your infielders and throw for the bag. Any infielder worth his salt will arrive at the base in time to catch the ball.

Fielding bunts. I've seen many a fine defensive team get more upset over a booted bunt than a home run. The catcher must react in an eyewink. As he breaks from position his hand flicks up for his mask, but this time instead of holding it he knocks it off with a quick flip over his head. Berra, one of the finest bunt-fielders in the business, never tries to fancy-Dan a ball. He uses both hands on every bunt, stopping the ball with the mitt if necessary. If possible, try to field the ball with your body facing first base. From this position you can most easily throw to any base. But the main thing is to get your hands on the ball in a hurry.

Covering the plate. Here's where the catcher really takes a beating, and here's where every eye in the ball park is on him. The rules prevent you from blocking the base line unless you have possession of the ball. To catch a throw from the left-field side, stand just in front of the plate. To catch a peg from the right-field side, stand

(Continued to page 250)

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just outside the base line. As soon as you have possession of the ball, block the base line completely with your body far enough away from the plate to prevent a successful hook slide. Most catchers drop to one or both knees to guard the plate. If the throw is wide, about all you can do is dive for the runner. Main thing is to have the ball firmly in your hand, as the runner may come barreling in with the idea of kicking it loose. Some catchers hold the ball in the bare hand, others in the mitt. Don't forget that you needn't touch the runner with the ball—just with the hand or mitt which holds the ball.

The catcher, peering out from the "jail" of his mask, must be alert to every possible way he can help his team. If he can safely leave home plate he should back up first and third on throws to those bases. He must keep his eye on the manager for signals. He's the only player who faces his own teammates. When he makes a play he must recover instantly for the next one.

Catching today has evolved into a scientific art. Every movement of the catcher means something. The man behind the plate must combine the intelligence of a quarterback, the ruggedness of a goalie and the strategy of a coach. He's very likely the most valuable player on the team. Keep your eye on him the next time you see a ball game. You'll not only enjoy watching him, but you'll see a lot more baseball than you ever saw before. ★ ★ ★

Slip-On Boot Cleats Anchor Fishermen

Fishermen wading on mossy rocks, slime and in fast water aren't as likely to slip with a pair of special cleats strapped to their boots. The metal alloy of the cleats clings to pores of wet rock. Special buttons dig and hold on moss and slime. Light in weight and with a flexible "hinge", the metal cleats are easy to wear, put on, take off, pack or carry.

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We Drove a Turbine Car Coast-to-Coast

(Continued from page 76)

until the engine is making 12,000 revolutions per minute. Then a relay switches the current flow and the constantly meshed starter converts itself into a generator to recharge the battery.

Now the spark shuts off. The flame is self-sustaining and the engine is running. It continues to rev up until it hits 20,000 revolutions per minute, its normal idling speed. It will now run continuously as long as fuel is pumped into the "firebox." We didn't stall the engine once on the trip. Flameouts apparently are no problem.

So far, this has taken about seven or eight seconds, roughly the same time it takes to get a piston engine running and in gear on a cold morning. Hot or cold weather makes no difference. It starts in sub-zero weather as quickly as in summer.

It is always in gear. There is no neutral, no clutch. The only shift is into reverse. We may add an "emergency low" later, but we have not needed one thus far. The engine is its own torque converter and no automatic transmission is necessary.

To drive away, you simply step on the accelerator, throwing more "coal" into the fire. A system of automatic controls keeps the engine from burning itself up. There are no limiting factors like mechanical valves to hold it back. It could run away with itself if the controls did not keep temperatures down to correct operating levels. Without these automatic controls, it would be a two-man job just to keep the engine running right. Each driver would have to have a "flight engineer" beside him watching the various dials.

In its present state of development, our gas turbine doesn't accelerate as fast from a stop as today's big V8 engines. But future engines can be as large as we want to get the desired characteristics. If you want to, you can spin the wheels by winding up the turbine against the brakes to about 35,000 revolutions per minute and then letting up the brake pedal.

The lack of friction in the engine presents another problem—the absence of engine braking. To provide an added margin of safety on the cross-country run, we put big 12-by-2½-inch brakes on the Plymouth. We will have licked any brake problems by the time the turbine engine is ready for production.

Top design speed of the experimental gas-turbine engine is 50,000 revolutions per minute (which would propel the car at about 85 miles per hour). We built the

(Continued to page 254)

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engine as a small, relatively low-power package. It will be easier to make it bigger and more powerful. Parts, like the turbine buckets, will be larger, easier to keep cool.

In the present engine, each of these buckets or blades is as small as your little fingernail. Yet each one is capable of producing about five horsepower. There are over 60 blades on the wheel, which is only about seven inches in diameter and could be slipped in your coat pocket easily. Initially, these wheels cost from $1000 to $1500 each. Our target cost for a 500-a-day production is $10 a wheel.

I haven't yet mentioned the key feature of the Chrysler turbine—the feature that makes it economically feasible. This is the regenerator that transfers much of the exhaust heat to the air from the compressor, increasing efficiency tremendously.

By taking about 1000 degrees of heat from the exhaust gas and adding it to the air going into the combustion chamber, we are able to boost part-load fuel economy from something less than one mile per gallon (which it would be without a regenerator) to a figure comparable to that of a high-performance V8 with automatic transmission. At the same time, we lower exhaust temperature to under 500 degrees, which is lower than piston-engine exhaust.

A common sight at each stop on our trip was that of an unbelieving spectator holding his hand close to the exhaust outlet to prove that this "jet" doesn't shoot flame.

This exhaust is amazingly clean, too. It will create no automotive smog. There is no carbon monoxide in it and it has been hard to find unburned hydrocarbons.

Don't get the idea, though, that all our problems are solved. Many still remain.

There is need for advances in metallurgy. If we can make turbine blades that will take 3000 degrees of heat, the engine will be much more efficient. As it is now, we have to cool the gas down to about 1500 degrees to prevent the blades from burning up. Better metals or combinations of metal and ceramics will let us operate at higher temperatures. This will mean we have to pump less air for cooling, increasing engine efficiency. The goal, of course, is to take in only as much air as is needed for combustion (as does the piston engine today). Then the turbine will be far more efficient than the piston engine because of its greatly reduced friction.

In the past five years, Chrysler Research has built more than 50 automotive turbine engines. That is an insignificant total compared with the piston-engine production of even one hour. But it is enough for me to say that we are on the way—and the car of tomorrow can be turbine powered. ★ ★ ★

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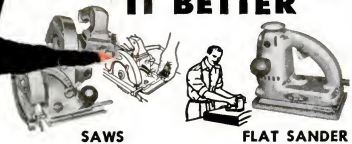

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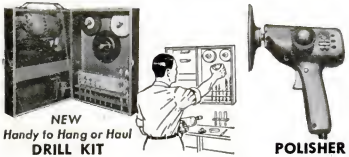

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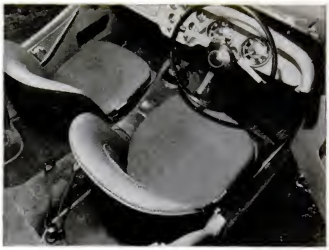
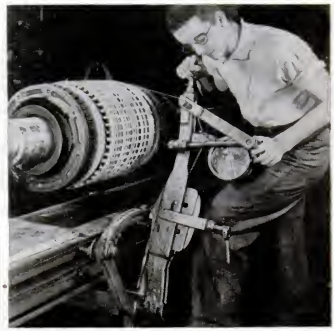


Hot Seat for Sports Cars

Sports-car owners will welcome an electric heating pad that is said to keep the driver warm even in open-top cars in winter. The pad, actually a molded seat cushion, plugs into an outlet mounted on the floor directly behind or under the seat. It operates on 12 volts and is completely safe as the bare heating element could be held in the hand without injury. Using only 12 volts, there is no shock hazard. Two types are available, one a molded, bucket-type seat cushion for sports cars, the other for use on bench seats and in trucks, buses and other commercial vehicles.

Dynamometer Measures Tension

Proper tension of moving wire is maintained with a tensioning arm that mounts a dynamometer. The instrument gauges the tension on a center pulley through which the wire runs. The operator, by watching the dial, can immediately increase tension when the needle on the dial drops.



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made easy!

Now *anyone* can get a professional wood finish every time.

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WOOD FINISH

A clear semi-gloss interior wood finish that SEALS, PRIMES and FINISHES. Nothing else to use. *Deft dries in 30 minutes.* No thinning. A 3-coat bar top finish can be had in a few hours instead of days. Use on paneling, floors, cabinets, furniture, any interior wood surface.

See your dealer or write for free Deft booklet. D-M

DESMOND'S 1826 W. 54th St., Los Angeles 62, Calif.

DO MORE PLANING JOBS WITH LOW COST BELSAW

LOW DOWN PAYMENT
EASY TERMS

Exclusive MONEY-MAKING Features: Full 12½" x 6" capacity • Power feeds at 14' to 34' a minute • Provides for Grinding Knives in the Cutterhead • Attachments for Jointing, Rabbeting, Tongue, Matching, Groove. Convert low cost rough lumber into high priced stock. Easy to make flooring and popular patterns. Send Today for FREE Literature and Prices.

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YIPEE – A SAWHORSE IN A *Jiffy*

Jiffy Brackets and 2x4s are all you need. Set up and knocked down in a jiffy—no nails, screws, or bolts required. Easy to move or store. Sold by hardware and building supply stores everywhere, or order direct.

GRAND HAVEN STAMPED PRODUCTS CO., Grand Haven, Mich.

6.95

FREE WIN A TRACTOR **FREE**
WRITE FOR ENTRY BLANK
NOTHING TO BUY

HEAVY OILIPH-BALL BEARINGS PUMPS MILLIONS OF GALS.

IRRIGATE, SPRAY, DRAIN OIL FILL ANYTHING—ANYWHERE! Will not Rust—Clog—or Leak. Patented Seal. Pumps 2800 gph. 420 rph at 75' high or 1600 gph from 25' well. Six blade impeller. Threaded for pipe. ¾ inlet. ½ outlet. Use ½ to ¾ hp motor . . . **7500 gph 9.95**
Heavier 2800 gph 8.95 . . . **Heavier 11.95**
Check, MO or COD—Money Back Guarantee
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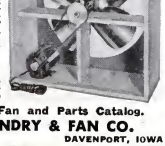
BUILD YOUR OWN WINDOW FAN

Save ½ or More
Enjoy Cool Comfort



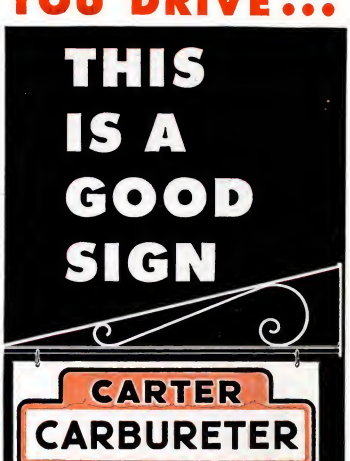
ORDER TODAY—A factory-packed fan kit containing fan blade, self-contained bearing and shaft assembly, two pulleys, and belt, plus easy assembly instructions. You use your own 1/6 HP or larger motor and lumber for frame. Iowa Residents add 2½% Sales Tax. If cash with order, we prepay shipment. If C.O.D., send 25% deposit.

Size	RPM	Approx. CFM	Price
20"	882	3990	$12.90
24"	662	4890	$14.90
30"	430	5880	$17.90

Send for FREE complete Fan and Parts Catalog.

KLOPPENBORG FOUNDRY & FAN CO.
211 MARQUETTE STREET DAVENPORT, IOWA

WHEREVER YOU DRIVE...



Wherever your automotive travels take you, you're never far from authorized Carter fuel system service. More than 25,000 Carter trained servicemen throughout the United States are authorized to display this sign. You can depend on them to give your car the same skillful, conscientious carbureter, fuel pump and fuel filter service you get from your Carter serviceman at home.

CARTER CARBURETOR
DIVISION OF acf INDUSTRIES
INCORPORATED
ST. LOUIS 7, MISSOURI

STOP SAGGING REARS!

with LOW-COST

AIR LIFT PNEUMATIC SPRING BOOSTERS

Car got that "middle age spread" look? Even new cars need help for overloads of luggage, equipment or extra passengers. AIR LIFTS fit between leaf springs and frame — inflate with air to support overloads up to 1000 lbs! Perfect for vacation trips, and so easy to install. See your dealer or write for his name.

Mast Models $20

FREE! . . . tip-packed literature on Air Lift remedies for sagging rears. Write Dept. 46.

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AIR LIFT COMPANY, LANSING, MICHIGAN

Make $500 an Hour CASH PROFIT THE DAY YOU START!

START YOUR OWN BUSINESS AT HOME . . . SHARPEN HOUSEHOLD, GARDEN AND SHOP TOOLS IN SPARE TIME

Now you can turn spare time into Big Cash Profits with new Belsaw Sharp-All. Sharpen knives, scissors, shears, snips, ice skates, mower blades, hedge trimmers, grass whips, axes, chisels, screw drivers, scrapers and saws . . . just about any household, garden and shop tool. Your own CASH business with no inventory. No calls to make. No experience needed.

Learn how easily you can start your own spare time business. Amazing low cost easy-payment plan. Send postcard for FREE BOOK.

FREE BOOK

BELSAW SHARP-ALL CO
716 Field Bldg. Kansas City 11, Missouri

Airport Lights That Blind Birds To Be Tamed by Filters

Birds flying south on migratory flights may soon be guarded from a modern hazard—the ceilometer, an airport unit which casts a bright vertical beam of light into the air. As many as 25,000 birds have perished in one night at a single airfield as they flew into the beam. Apparently the beam blinds the birds or blunts their sense of direction, causing them to crash into the ground. Filters for the lights have been developed which screen out visible light and allow only ultraviolet light to escape. Two such filters have been tested, with good results. The Air Force is considering their use.

Rake-Hoe-Weeder

You can rake, weed or hoe with a garden tool that adjusts to three positions. The flexible steel prongs attached to the base of the aluminum handle are extended in a fan position for raking. To convert the tool into a hoe, a push button on the handle is pressed to draw the prongs together to form a solid sheet of metal, including the ends which bend hoe-fashion into the ground. In the weeding position, the prongs are not brought entirely together, leaving numerous spaces in which the stems and roots of weeds can be caught and pulled up.

NEW! ELECTRICALLY HEATED RECLAIMO

A Wm. Schwalge Product

OIL RE-REFINING Filter

Super-Efficient Filtration

for TODAY'S Car-Truck-Tractor Engines

INCOMPARABLE PERFORMANCE!! RECLAIMO—REMOVES Solids — PREVENTS Excess Water Accumulation, Acid and Sludge Formation —CHECKS Fuel Dilution—MAINTAINS Stable Viscosity! Keeps engines "young and frisky" with crankcase oil in peak lubricating quality at all times. FULLY GUARANTEED.

ENDS NEEDLESS OIL CHANGING!

NEW FEATURES: Electric Heat from generator, thermostat controlled—Dual Flow by-pass—Steel non-corrosive body—hinged mounting bracket—Easy to install or transfer to other equipment.

JUDGE FOR YOURSELF! Each Reclaimo is sold with an unconditional 6 months' no-risk return privilege.

Write for folder with full details.
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Manifold-heated Reclaimos NOW OBSOLETE, accepted (new or used) for trade-in.

* Wm. Schwalge, Author, Inventor, Pioneer in oil reclaiming since 1910.

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Attic Fans • Exhaust Fans • Pedestal Fans • Window Fans • Shutters • Motors • Tub Enclosures • Sewing Machines • Awnings • Home and Industry Supplies

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16" Attic or Window Fan Kit. Includes Steel Blade—2 Pulleys—2 Bearings—2 Collars—Shaft—Instructions—Easy assembly. Enclose Postage with order. (Wt. 7 lbs.) $7.95 SALE PRICE REG. PR. $15.90

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New Black & Decker 6½" H.-D. Saw!

Extra Capacity • Extra Safety • Extra Power
Extra Convenience • Extra Adjustment Features!
See your B&D dealer for demonstration. The Black & Decker Mfg. Co., Dept. M-66, Towson 4, Md.

ELECTRIC SELF STARTER

for small aircooled engines up to 12 horsepower.—All kits designed for easy installation on lawn-mowers, garden-tractors, etc.

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WORLD'S LARGEST SELECTION—Lowest Prices

Your buying guide for finest kiln dried domestic and rare imported woods, inlays, bendings, matched plywood, mouldings, ornaments, etc. Biggest selection of tools and hard-to-find hardware. Packed with scroll saw patterns, projects, wood facts and money making ideas. Enclose 25¢ (refunded on first order) to help pay mailing and handling costs. Write today to

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1 Use AMERICAN Dripless Oil for best lubrication and rustproofing of guns, fine mechanisms and appliances. Runs in—won't run out. 29c.

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SPECIAL OFFER!
send $1.00 for complete set of all large sizes to Dept. M-6
AGS COMPANY, Muskegon, Michigan

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My Williams locking adjustable is the most used wrench at the shop and at home. No other wrench offers so many features or is so easy to use."

NEW PATENTED LOCKING FEATURE AT NO EXTRA COST

6"
8"
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at most leading hardware stores

WILLIAMS

LOCKING ADJUSTABLE WRENCH

- No obstructions
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- Drop-forged from selected alloy steel and heat-treated
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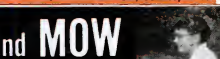
THE HANDIEST WRENCH YOU'LL EVER OWN



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RIDE and MOW with the SHAW DU-ALL

Model RM 24 (24" cut)
or
Model RM 32 (32" cut)

Biggest little mower on the market!

LOW PRICE, too. Great for estates, farm and suburban homes, parks, cemeteries, etc. Trims smartest lawn; or tallest grass, turning radius only 45 inches. Sturdy 2½ to 3 H.P. air-cooled engine. 110 volt starting motor plugs into house current (optional). RM 32 is 6 H.P.

WRITE TODAY for free folder, prices, and full details. Also walking and riding tractors, 1½ to 12 H.P.

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Smoother casting longer lasting

casting-spinning-squidding lines

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WATERPROOF
WEAR-RESISTANT

H-I ... Preferred at Famous Fishing Spots

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H-I unconditionally guarantees these lines to be the finest on the market today, regardless of price! Prove it for yourself, at your dealer's.

Look for H-I on the tackle you buy

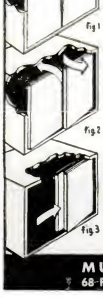
Rods, Reels, Lines, Lures, for every fisherman and every kind of fishing

Valuable Fishing Guide. Send 25¢ to HORROCKS-IBBOTSON CO. Dept. PM-616 UTICA, N. Y.

Manufacturer of the largest line of fishing tackle in the world

INTRODUCING A NEW IDEA!!

FLUSH SLIDING DOOR HARDWARE



Now you can quickly — easily install sliding doors in your cabinets and have the doors perfectly FLUSH with the surface, (ideal for built-in cabinets). No hardware will be visible and your cabinets will take on an entirely new, clean appearance.

With **MULRAY D-34 FLUSH SLIDING DOOR HARDWARE,** the doors slide on the tracks and are FLUSH when closed, (Fig. 1). When opening either door, the tracks automatically switch, (Fig. 2); and one door slides behind the other, (Fig. 3).

D-34 Hardware consists of 2 pr. assembled track-switch units for top and bottom of cabinet opening and instructions. (D-34 Hardware is designed for doors up to ¾" thick and cabinet openings to 4' H. x 6' W. Tracks may be cut down to fit opening exactly).

30" inside cabinet opening—$4.50; 36"—$4.85; 42"—$5.20; 48"—$5.55; 54"—$5.90; 60"—$6.25

If D-34 Hardware is not available at your local Hardware Store, order direct. Send a check or M. O.

MULRAY PRODUCTS, INC.
68 FIRST STREET, NEW ROCHELLE, NEW YORK

Tackless Carpet Binder

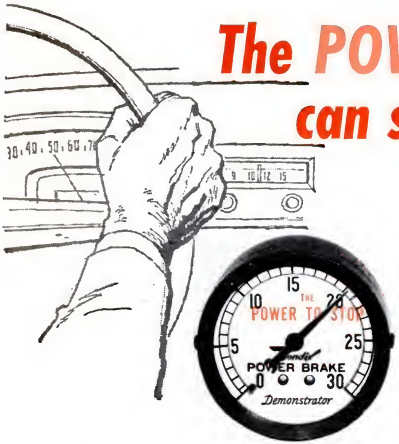
Carpet edges that do not butt against a wall can now be bound with a one-piece aluminum anchor and edge binder that requires no tacks. The edge of the carpeting is gripped by a series of sharp barbs, and a protective tap-down segment along one edge eliminates the need for stitched or "latexed" carpet edges. Slots are provided for nails that secure the anchor strip to the floor. Carpet padding is cut flush with the inner edge of the anchor strip.

Sonic Boom Outlawed in Sweden

Sonic booms have been outlawed in Sweden, as the Swedish air force issued regulations that its planes must not pierce the sonic barrier—with the resulting boom—at altitudes of less than six miles over land. The sound barrier was first cracked in Sweden in 1953 by an A-32 "Lance" jet. This fighter-bomber, now being delivered to the Swedish air force in quantity, is a two-seater with a top speed of 700 miles per hour. It's an all-weather plane capable of carrying a heavy load of rockets, bombs, guided missiles and tactical atom bombs.

¶A Japanese newspaper recently published a color photograph that was transmitted by radio from California.

The POWER TO STOP can save your life!



Once you've tried Bendix* Power Brakes—and marveled at the difference they make in stopping ease—you'll demand them for your present car, whatever its make. Ask for a test ride today. Car dealers, better garages, service stations and brake shops across the country have cars equipped with Bendix Power Brake Demonstrator Units. When you've seen the difference, *felt* the difference, you'll know they're the finest automotive buy on the market. And get this: Average price—about $60 (including installation)!

*REG. U.S. PAT. OFF.

Bendix POWER BRAKES

Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Holder for Eyeglasses

Athletes, anglers and other active people keep their glasses safely anchored with an elastic strap that goes around the back of the head. Short lengths of rubber tubing grip the stem ends of the glasses. The adjustable strap unsnaps to permit easy removal. The strap was invented by a Joliet, Ill., dentist who now produces up to 50,000 per year in the basement of his home.

Backward-Facing Tractor

When engineers of a farm-implement company decided to build a fork-lift tractor, they simply modified the design of a field tractor and made the front the rear. The driver sits atop the hood and controls the fork lift mounted where the drawbar was. The tractor's high clearance and large wheels allow it to operate in mud, snow and on rough surfaces. Counterweights prevent tip-over and permit it to hoist 4000 pounds.

END TRANSMISSION FAILURES

CAUSED BY LUBRICANT LOSS

HERE'S GREAT NEWS FOR CHEVROLET AND FORD OWNERS! HERE, AT LAST, IS A WAY TO END LEAKY TRANSMISSIONS! The Davis Ball Boot seals both ends of the transmission coupling on Chevrolets; 1937 through 1954 . . . keeps dirt out, oil in, saves expensive metal parts.

For '55 and '56 Chevrolets, and Fords from '49 to '55, the Davis Ball Boot protects the factory seals against the intrusion of road grit . . . prevents failure of seals and bushings that result in lubricant loss.

Don't risk a burnt-out transmission. Don't put up with "temporary" repairs. ORDER A DAVIS BALL BOOT TODAY and END this trouble! Fits standard and automatic transmissions . . . easy to install . . . lasts for the life of your car . . . unconditionally guaranteed! (Pat. No. 2,702,996).

DAVIS BALL BOOT CO., INC., 2301 Yale St., Houston, Tex.
Rush postpaid the following Davis Ball Boot:

☐ For 1937-1954 Chevrolet @ $4.85 each.
☐ For 1955-1956 Chevrolet @ $1.45 each.
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☐ Check ☐ Money Order Enclosed ☐ Send Literature

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DAVIS BALL BOOT CO., INC.
2301 YALE STREET, HOUSTON 8, TEXAS

RETAIL PRICE $125.00
FACTORY TO YOU $79.95

SUPERSHOP includes precision-built 8" tilting table saw, vertical and horizontal drill press, 30" lathe, sander, grinder. 100% BALL BEARING. Write for FREE catalog, full details, trial plan. Easy Pay Plan.

POWER TOOLS, INC.
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Grips the screw!
Drives it too!

Quick-Wedge
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SCREWDRIVER

2" to 14" blades, 4 bit sizes
Available with shockproof plastic covered tubing
Unconditionally guaranteed

ASK FOR IT AT YOUR DEALER
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Finder Points Out Stars

Amateur astronomers with little knowledge of mathematics can find particular stars with a new instrument which does the calculations automatically. Though the astronomer doesn't do the figuring himself, the instrument makes the mathematical process clear to him as it is set to point accurately at any planet, star or cluster. The base of the instrument is installed permanently in the lawn, but the calculator and pointer can be detached and taken inside for protection. Designed for beginners, the instrument also can be used as a finder for a portable telescope.

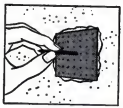
Deaf Persons May Work With Noisy Jets

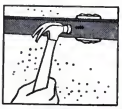
Totally deaf persons are being tested at Pensacola, Fla., to determine what effect noise may have on those who can't actually hear it, with the idea that the Navy may employ such persons to work around jet planes. The average person finds noise levels above 140 decibels intolerable. Most jets now in use create sound levels around 130 decibels, and others in the production stages will have engines producing up to 160 or 170 decibels—greater than humans can stand. The tests are designed to learn whether these sounds will produce injurious effects even if they are not heard.

¶Fluorescent lamps capable of flashing on and off like incandescent bulbs will soon appear in advertising display signs.

FINISH CONCRETE OR MASONRY WALLS WITH WALLBOARD OR WOOD PANELS—

Do It Yourself this easy, low-cost way!

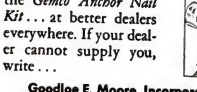




Just attach *Gemco Anchor Nails* (16" apart) to walls with waterproof *Tuff-Bond Adhesive.* These will hold furring strips securely in place. Then nail wallboard or wood panels to furring strips . . . and the job is done. It's that simple! All you need is the *Gemco Anchor Nail Kit* . . . at better dealers everywhere. If your dealer cannot supply you, write . . .

Goodloe E. Moore, Incorporated, Danville 2, Ill.

There's a **KATOLIGHT ELECTRIC PLANT** for every portable or standby power need.



HOME • FARM • COTTAGE • COMMERCIAL

Katolight Portable Power Plants give you electric power anywhere . . . anytime. Standby Plants permit uninterrupted operation of all electrical equipment despite power failure. Extra high overload capacity, long life, dependability. Full line from 350 Watts to 75 KW and larger.

WRITE FOR NEW FOLDER **KATOLIGHT CORPORATION, Box 881-22 Mankato, Minn.**

Find HIDDEN TREASURES

GOLD, SILVER, PRECIOUS METALS with the Famous Model 27 Metal Detector. Lightweight, ultra-sensitive, low cost. None finer. Also GEIGER COUNTERS for uranium and the VIOLITE for tungsten. INFORMATION FREE

THE *Delectron* CORP.
5528 Vineland Ave., No. Hollywood, Calif.

Say You Saw It in Popular Mechanics

KEEP ALL SAWS SHARP

SUPER SAW FILER NO. 6

IT'S NEW! with Automatic DEPTH CONTROL ROLLERS

Automatically controls **DEPTH—ANGLE—PITCH**

SHARP SAWS CUT TRUER

Perfect bevel and angle maintained, and foolproof depth control for all Rip, Cross-cut, and Handsaws. Precision made and calibrated for instant setting at desired angle. Can be used in any vise or clamp. Complete with file, only . . . . **$6.50** ppd.

SAVE TIME AND $$$

JOINT & SHARPEN CIRCULAR SAWS

Sensational new Super Filer No. 11 Joints and sharpens both hand and circular saws, 6" to 10" with all teeth the correct height, depth, pitch and bevel. Easy to use—when file hits hardened steel roller, teeth are finished. Saw runs true and smooth with no side pull. Complete with special 8" file **$9.95** ppd.

"TRU-CIRCLE" saw set automatically sets teeth at 10° or more **$2.95.**

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TURNER *Util-i-torch**

that has hundreds of uses!

only **$4.99**

* propane gas

- easy to operate
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Now you can do hundreds of jobs quickly and easily with the TURNER "Util-i-Torch." It's light weight, compact, long burning and extremely versatile. See, try and buy this big value at your neighborhood hardware store today.

And on all the other jobs for which you've wished you owned a blow torch.

disposable cylinder

THE TURNER BRASS WORKS
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JUST ADD WATER

• For the SAKRETE 48-page booklet with photos, diagrams and instructions for "Do it yourself" cement jobs, see your building supply dealer, lumber dealer or hardware store or send 25 cents to —

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Gravel Mix —
Sand Mix —
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SAKRETE

SUPREME
Versamatic
REVERSIBLE SCREW DRIVER AND SPEED REDUCER

First time ever! It REVERSES!

Drive *and remove* screws with Supreme Versamatic. Versamatic reduces speed 7 to 1, increases power 7-fold. *Reverses* with one twist. Handles even the largest screws with ease. Also for nut running (adapter furnished); tapping; and all heavy duty drilling where speed reduction is needed. Fingertip control means safe, fast work. Complete set $14.95. (½" chuck extra). At better hardware stores.

SUPREME PRODUCTS, Inc., 2222 S. Calumet, Chicago 16

Mobile Scaffold

Carpenters can drive a new mobile scaffold right up to the job. A truck and a trailer unit are manufactured. The trailer unit, unlike the truck-mounted unit, has its own chassis and can be collapsed for transport. The work platform of the units travels up and down on steel beams. Cables suspend it from pulleys at the top of the beams, and a winch driven by an electric motor regulates the cables. A generator powers the electric motor on the truck scaffold, which also mounts a bed for holding lumber. A switch mounted on a long extension cord permits control of the units from ground or scaffold. Heights up to 40 feet can be reached with the scaffolds.

GIGANTIC SAVE-TO-70% **MAIL SALE** WAR SURPLUS EXCESS INVENTORY BANKRUPT STOCK

WEED SPRAY OUTFIT

• Leading make. Latest design, 3-row (17') P.T.O. tractor drive finest pump. T-jet nozzles, precision controls, gauges, hose. Complete. List $175.00. Postpaid in U.S.A. **$97.65**

FREE big weed spray catalog.

EXTRA SPECIAL OFFERING! GIANT ARMY BOX KITE

Order Now — only 100 Available!

Approx. size 14'x10'x3'

• During war these huge kites were towed behind ships on long cables to entangle enemy aircraft—also used over London.

• Made of a very strong, light silken fabric. Prefabricated light weight wood frame. Unit is shipped knocked down. Can be assembled in 15 minutes—reassembled in two.

Weighs 25 lbs!

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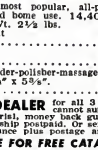

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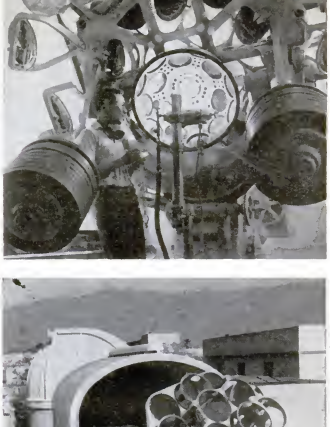

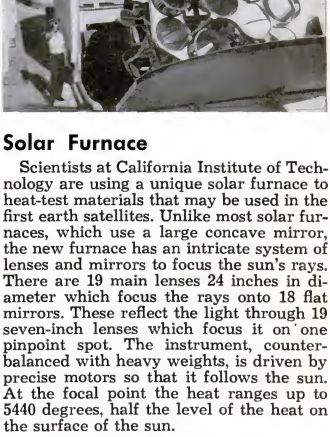

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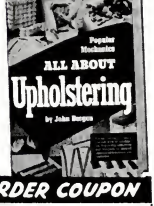

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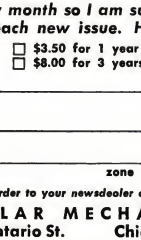

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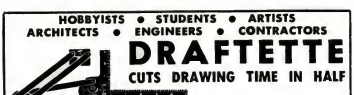

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Factory price **$275.00**

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1½"	25 ft.	14.75
2"	10 ft.	16.50
2" (no cord plys)	10 ft.	9.50
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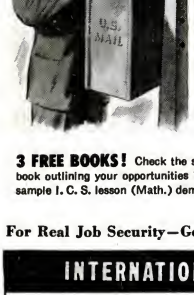

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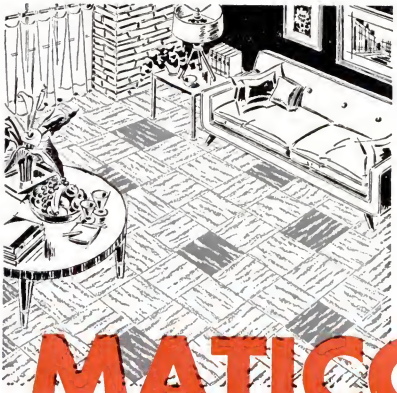

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